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Client Analysis & Relationship Development

Training Provision in

Large Scale Wind Renewables

CARD Group

September 2010

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Summit SKILLS

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1.0 Executive Summary

This Report

Energy and Utility Skills has been the lead organisation on a collaborative research project with several other Sector Skills Councils – ConstructionSkills, SummitSkills - that have interests in Renewable Energy. The research has the backing of the Department for Employment and Learning in Northern Ireland, and aimed to highlight the skills and training issues affecting large scale wind-energy generation. This report details the findings of the study.

State of the sector

Currently 99% of global installed wind generation capacity is onshore. However the offshore wind market is expected to increase significantly by 2020. Wind energy supports an estimated 4,000 jobs in the UK and 1,500 in Ireland and 400 Northern Irish jobs currently. This is expected to increase to an anticipated 36,000 in the UK (Bain) and more than 10,000 in Ireland (IWEA-Deloitte).

Growth is the only constant

Organisations operating in Northern Ireland must contend with typical growth issues faced by successful companies in an expanding market against a background of economic recession. These include company attractiveness, accessing up-to-date training, multi-discipline job descriptions, job life-cycle and promotion paths and sourcing the right person for the job in a sector where change is a constant and the right person for the job does not exist.

Onshore currently a higher priority

The onshore division being a more mature market has a better understanding of the skills and experience required to meet the challenging 2020 targets. Offshore potential is relevant to some operators in Northern Ireland but recruitment and training activities are not yet on the agenda. This is viewed as disappointing by some, who feel the Province has an excellent opportunity to become a skills exporter in wind generation.

A new sector must poach existing skills

Two main routes of entry have emerged into the sector; a sideways movement from a related industry and secondly directly from college or university. Few people have the desired skills, fewer still have the necessary experience, and recruitment can be difficult. Individuals with an effective mix of technical competence and business management experience are elusive.

Most respondents highlighted the growing demand for electrical and power engineers and their increasing concern at the dwindling supply. Several requested prompt action at stages along the supply chain to make these disciplines more accessible as a career choice.

Lack of consensus over ideal entry qualifications

The research encountered a lack of consensus currently over what qualifications are desirable to enter the industry. Employers disagreed on whether a degree is a necessary requirement, and whether a general engineering, construction or mechanical qualification is sufficient. Employers found it challenging to specify the relevant qualifications required for a specific role as experience in the use of the qualification was deemed a crucial factor. It is anticipated that as the sector matures, more specific qualifications will be demanded by the industry.

General entry qualification has a limited use

The idea for a general entry-level course was rooted in a perception among employers that current courses were fragmented and incomprehensive. Some thought a general entry-level qualification for employment in the sector would demonstrate the applicant's fitness for purpose. While few would accept this general qualification alone, some employers thought it might reduce the in-position training time required to bring the new appointment to an acceptable level of competence.

Consensus around Health and Safety only

One area of consensus is on the necessity of comprehensive and up to date set of Health and Safety certifications. Several participants mooted the idea of a wind-farm passport, showing a full and up to date set of the certificates necessary to be safe on site.

Training for competence versus training for progression

Two main themes emerged: training for competence and training for progression. Several comments highlighted how some new appointments were "promotion-hungry" and wished to

progress rapidly to higher levels in the sector. This caused medium-term problems as they were needed to fill the position for which they were originally recruited.

Pre-employment training relevant to most off-the job aspects

Where convergence exists over training needs amongst different companies, it is likely that these training needs can be met through pre-employment training at Further or Higher Education level. Conversely, where employers require specialised training, this will likely be accessed through private training providers, or on-the-job training.

Qualifications cannot be viewed without experience

Employers felt courses must contain adequate opportunities to develop on-site experience. Some have already invested in apprenticeships and graduate placement programmes. This is an employer priority.

Joined up working required

Participants saw the emerging need to work closely with education to develop effective courses and transition into the sector, however still recognised the difficulties of investing time and also of foreseeing the disciplines required to meet future demand.

Industry Engagement

Education and training providers see the value in engaging with employers to develop suitable, sector specific courses and qualifications. As with employers - all of the training providers involved in this research felt that there are gaps in provision. The National Skills Academy for Power and the National Occupational Standards for Power will be influential in accurately defining these gaps. A collaborative approach would make most effective use of locations and resources.

Providers as drivers

Education providers must be seen as employers whose role is both to supply industry demand and also lead research and development. Through anticipating industry trends, educators will continue to facilitate and make possible sectoral growth and innovation.

'Hands-on' training

Training that develops practical skills and knowledge would be welcomed by course providers, as well as course participants and employers. However, there are funding and resources challenges in

achieving this which have to be addressed. Nevertheless, experience is viewed as critical in the skills mix required by employers of potential recruits.

Building on strong foundations

In many cases, the skills that are needed in the large scale wind energy generation sector are not new. Rather, they are skills that are already taught in more 'traditional' courses, but which require a renewables context. It is important therefore that education and training providers do not 'reinvent the wheel', rather, they should look to the content and combination of courses from a wind energy generation perspective.

STEM Subjects

Given the rapid growth and expansion of the sector, it may be difficult for the supply of skilled and experienced people for the workforce to keep pace. Education providers and employers alike are recognising the importance of taking a long-term approach to the skills issues. Employers in the industry are looking at how to feature renewable energy generation in influencing the uptake of STEM subjects in schools and cultivate interest in careers in the large scale wind industry.

2.0 Introduction

Energy and Utility Skills (EU Skills) is the Sector Skills Council responsible for the gas, power, waste management and water industries. EU Skills is the lead organisation on a collaborative research project with several other Sector Skills Councils that have interests in Renewable Energy – predominately ConstructionSkills and SummitSkills. The project has the backing of the Department for Employment and Learning in Northern Ireland, and aims to highlight the skills and training issues affecting large scale wind-energy generation.

This report details the findings of the study. It assesses the skills preferences of employers operating in the sector, against the education and training available, to identify opportunities to enhance provision where possible. The main objective is to ensure there is a comprehensive portfolio of fit-for-purpose courses and qualifications.

2.1 Background

The Department of Energy and Climate Change (DECC) was created in October 2008 to ensure energy is secure, affordable and efficient, to bring about the transition to a low-carbon Britain and to achieve an international agreement on climate change.

A key part of the Low Carbon Transition Plan is the Renewable Energy Strategy, published in July 2009 which sets out a path to increase renewable energy generation, recognising it as a vital component of the UK's energy mix.

The UK's predicted energy consumption in 2020 is 1590 terawatt-hours (TWh). A challenging target has been set to generate 15 percent of this (239TWh) from renewables (including wind) - a seven-fold increase from the 2008 level of 39TWh. While this study was in progress, the Crown Estate released round three of its offshore generation contracts. This release intends to supply 33 Gigawatts (1 TW equals 1000 GW) of UK offshore wind energy generation capacity by 2020. This is in addition to the 8 GW in progress from Rounds 1 and 2.[1]

While the Renewable Energy Strategy applies right across the UK, the Department of Enterprise, Trade and Investment has suggested that Northern Ireland could achieve significantly higher targets. The *Statutory Consultation on a Strategic Energy Framework for Northern Ireland 2009* asserts that

[1] RenewableUK

"Northern Ireland could set a new strategic goal to increase the amount of electricity from renewable sources to 40% by 2020." This is a very considerable increase from current figures which show that 7% of electricity produced and consumed in Northern Ireland comes from renewable sources. This growth will undoubtedly go hand in hand with increased economic opportunities and job creation; a 2008 Carbon Trust report – *'Northern Ireland Renewable Energy Supply Chain'* – suggested that over 33,000 renewable energy jobs could be created in Northern Ireland if businesses grasped the opportunities arising - almost 10,000 of which are related to the on-shore and off-shore wind sector.[2] However this greatly exceeds the predicted 36,000 UK-wide jobs anticipated by Bain in their report, *'Closer look at the development of wind, wave and tidal energy in the UK – Employment opportunities and challenges in the context of rapid industry growth'.*

In either scenario, developing a comprehensive Renewables Skills Strategy will be essential to provide the skilled workforce that the sector will need by 2020. An ineffective supply of suitably qualified people will lead to delays in the implementation of the Government's energy strategy, less than optimal operation of generation capacity and the potentially adverse financial and economic implications of an insecure yet growing demand for energy.

The issue has been recognised in the industry. Bain's report highlighted skills issues within the sector. Key areas of concern cited with regards to the workforce were the lack of experience, lack of qualifications, and a shortage of applicants with the necessary skills.

2.2 Purpose of the research

The purpose of this research is to identify employers' skills needs, and to understand whether these needs are provided for through education and training, and in so doing to inform the development of a strategy and action plan to address skills issues and challenges for the large scale wind energy sector in Northern Ireland. Therefore this study sought to gather data specific to Northern Ireland's wind industry in the following areas:

2.2.1 Workforce skills

To understand the current priority workforce skills, entry routes, and the qualifications required by employers in Northern Ireland's wind industry in order to highlight any current skills shortages specific to Northern Ireland within this emerging industry.

[2] 'Northern Ireland Renewable Energy Supply Chain' Carbon Trust, 2008

2.2.2 Training provision

To understand current and planned courses, qualifications and the capacity for training that is suitable for large scale wind energy sector in both Higher Education and Further Education, and through private training providers.

2.2.3 Emerging gaps

To assess the gaps between required and available training in terms of scale, content and quality bearing in mind both the current and the projected workforce figures, based on the Government's 2020 scenarios for the wind industry.

2.2.4 Guiding principles

Alongside these three key objectives, two guiding principles were identified as necessary to achieve the overall project aims:

- Relationships should be cultivated with employers, education and training providers, and key stakeholders to encourage buy-in to the research outcomes and a legacy of collaboration on important strategic issues.
- Any research outcomes or suggestions should be 'co-created', incorporating the views of all research participants and feedback from the Cross Sector Renewables Group.

3.0 Methodology

The project methodology was devised by the research team in consultation with the Cross Sector Renewables Group, and informed by the expertise and experience of all partners. A number of minor amendments were made to the methodology, based on new information and avenues to explore which were uncovered as the project progressed.

3.1 Research processes

Information was gathered principally through primary research involving face to face discussions with:

- Employers
- Key stakeholders (e.g. Industry and government bodies)
- Education and training providers

In determining what questions should be asked and issues probed, existing research and literature was reviewed – this also provided a vital contextual understanding of the sector – and the Cross Sector Renewables Group was consulted.

Research participants were selected for their involvement in the sector, determined through advice from the Cross Sector Renewables Group and through preliminary research on the internet accessing the membership of organisations such as RenewableUK and IWEA. They were then approached by a member of the research team and invited to participate.

A broad range of participants were invited to participate in the research, in order to gather views from across the wide spectrum of employers and education and training providers. Employers ranged from operations and maintenance through to manufacturing, while both further and higher education providers were included. One cohort from which it was difficult to source participants was from the private training sector, however this reflects their small presence within the province.

Minutes were taken of each discussion, collated, and circulated to the relevant respondent for their approval. These minutes provided the core information which was analysed and is detailed in the main body of this report. Information and analysis was shared with the Cross Sector Renewables Group for their input, and all conclusions and recommendations are based on solid evidence gathered from respondents.

3.2 Research participants

	Organisation	Respondent	Group
1	Action Renewables	Michael Doran, Neil Mullan	**Employers**
2	Airtricity	Paul Cooley	
3	B9 Energy	Bernadine Robinson, Paula Coard	
4	B9 Energy	Michael Mitchell (wind farm manager)	
5	RES Group	Mylène Baxter, Lucy Ford-Hutchinson	
6	Siemens Energy	Gary O'Callaghan	
7	Harland & Wolff	David McVeigh, Herbie McIlvenny	
8	Enersol	Oisin McCann	
9	ESB International	Gary Connolly	
10	EU Skills	Rob Murphy, Sara Ford	**Key Stakeholders**
11	Global Wind Alliance	Clifford McSpadden	
12	IWEA	Johanna Cafferkey	
13	BWEA (now RenewableUK)	Fruzsina Kemenes	
14	Queens University Belfast	Prof. Brendan Fox	**Universities: Higher education providers**
15	University of Ulster	Dr Philip Griffiths	
16	South West College	Josephine McCanny	**Regional Colleges: Further education providers**
17	Carbon Zero NI (SW College)	Josephine McCanny	
18	Belfast Metropolitan College	Stephen Frazer	
19	Letterkenny IT	Dr John Doran	**Institutes of Technology**
20	Dundalk IT	Dr Laurence Staudt	
21	FIT Renewable Energy	Peter Davitt	**Training for marginalised job seekers**
22	GL Garrad Hassan	Andrew Brown	**Private training provider**

3.3 Structure of the report

This report is structured to provide a comprehensive and logical overview of employers' skills needs in the large scale wind energy sector in Northern Ireland, the current education and training provision here, and any gaps identified.

It commences with an overview of the wind energy landscape, containing policy targets, brief profiles of relevant organisations and a synopsis of the skills infrastructure in the UK.

The main body of the report consists of two sections: an Employer analysis, *'Demand side'* detailing the outcomes of our discussions with research participants, and secondly an Education analysis: *'Supply side'* which collates information provided by public and private training bodies.

The report concludes with a strategic gap analysis and recommendations for action on a renewable skills strategy.

3.4 Audience

This report is aimed at a number of audiences. It is our intention that solid conclusions and recommendations will enable both employers and education providers to assess their role in ensuring a sufficient supply of suitably skilled employees.

Various government departments, including the Department of Employment and Learning, and the Department for Trade and Investment, should find the results informative towards skills and sustainable development strategy and resourcing.

Finally, the report is intended to be accessible to anyone with an interest in energy generation from large scale wind, both now and in the future.

4.0 The Renewables Landscape

This study concerns large scale power generation from wind energy. This can take the form of land-based onshore wind turbines, or offshore turbines. There are currently 150 Gigawatts of installed wind generation capacity globally, 99% of which is onshore. Wind energy continued its growth in 2008 by 29% on the previous year, supporting 440,000 jobs globally and a turnover of €40billion.

Position 2008	Country	Total Capacity Installed end 2008	Added Capacity 2008	Growth Rate 2008 (%)
1	USA	25170	8351	50
2	Germany	23902	1655	7
3	Spain	16740	1595	11
4	China	12210	6298	107
5	India	9587	1737	22
6	Italy	3736	1009	37
7	France	3404	949	39
8	UK	3287	898	38
9	Denmark	3160	35	1
10	Portugal	2862	732	34
…	…	…	…	…
15	Ireland	1244	439	55

World Wind Energy Association, Feb 2009

The UK ranked eighth in the total installed capacity by end 2008, behind Italy and France, while Ireland ranks 15th. Ireland demonstrated a promising growth level of 55% on 2007 levels of installed capacity. The European Union accounts for 55% of world wind generation capacity and an astonishing 99% of offshore capacity. The UK currently has a 44% share of the offshore wind market in Europe while Denmark is second with 30% (*World Wind Energy Association Feb 2009*).

Wind energy companies in Europe directly employ around 108,000 people and a further estimated 43,000 indirectly (i.e. those providing components, services or those working sporadically in wind related activities).

The European Wind Energy Association (EWEA) estimates that there were 4,000 people employed in the UK in large scale wind energy and a further 1,500 in Ireland. Data for Northern Ireland

employment specifically is not available however, a recent study, "Jobs and Investment in the Irish Wind Industry" conducted by the Irish Wind Energy Association (IWEA) and Deloitte estimated that the industry requires 1.5 jobs per MegaWatt of installed capacity. This would include Planning, Financing, Construction and Maintenance, but not ancillary services, indicating that there would be approximately 440 jobs currently supported in the Northern Ireland wind energy sector. Using the same equation would suggest that 1200 direct jobs would be required by 2020.

4.1 Wind Energy

The Department of Energy and Climate Change (DECC) defines renewable energy as *"energy that occurs naturally in the environment. This includes energy from the wind, waves or tides."*[3] For the purposes of this report, the focus is on energy derived from wind.

4.1.1 Onshore Wind

There are currently more than 2900 wind turbines in operation in 260 onshore wind farms in the UK contributing more than 3.5GW to the energy grid.

	Onshore	Operating Wind farms	MW
1	England	93	757
2	Scotland	100	2127
3	Wales	32	379
4	Northern Ireland	27	309
	TOTAL	**252**	**3574**

37 more sites are currently under construction.

	Onshore	Wind farms under construction	MW
1	England	10	84
2	Scotland	22	1116
3	Wales	3	32
4	Northern Ireland	2	30
	TOTAL	**37**	**569**

[3] http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewable/explained/introduction/introduction.aspx

In addition, almost 470 sites have been consented or currently in planning.

	Onshore	Consented or planned projects	MW
1	England	188	2,356
2	Scotland	179	6,007
3	Wales	37	1,587
4	Northern Ireland	61	1,081
	TOTAL	**469**	**11,034**

While the sector is still relatively young, and will inevitably undergo significant further development, the installations to date will have produced a strong foundation of skills and experience based on the learning derived from their design, construction, operation and maintenance.

There is a wider understanding of the ancillary disciplines required to achieve a public and environmental tolerance of large turbines. These do not fall directly under the power generation remit, however in appreciating the broader context and operating environment of the sector, these are important disciplines to be aware of.

It is anticipated that suitable new sites for onshore wind farms - those that can produce a satisfactory return on investment and that are environmentally acceptable - will decrease as a natural capacity is reached. At this stage, skills priorities for onshore wind farms would be expected to move from planning and construction to general maintenance and upgrading efficiency.

4.1.2 Offshore Wind

Although the industry is very much in its infancy, the UK already leads the world in offshore wind farms, with 12 sites providing 1GW of power and a further 5 currently under construction.

Offshore wind is creating some of the largest infrastructure projects in the world with a potential market investment of over £100 billion.

	Offshore	Operating Wind farms	MW
1	England	9	881
2	Scotland	1	10
3	Wales	2	150
4	Northern Ireland	0	0
	TOTAL	**12**	**1041**

5 offshore sites are currently under construction – all off the English coast.

	Offshore	Wind farms under construction	MW
1	England	5	1452
2	Scotland	0	0
3	Wales	0	0
4	Northern Ireland	0	0
	TOTAL	**5**	**1452**

15 projects are have been given consent to progress or are in planning.

	Offshore	Consented or planned projects	MW
1	England	11	4303
2	Scotland	0	0
3	Wales	1	576
4	Northern Ireland	0	0
	TOTAL	**12**	**4879**

The small number of offshore wind farms in operation might suggest there has been a limited opportunity to develop construction experience and skills in the offshore environment. Offshore operations and maintenance experience may also be limited given the environmental adaptations required to service such appliances. Indeed relevant transferable skills sets and sectoral aptitude are as likely to be sourced from the oil and petro-chemical industries as from onshore turbines.

We might therefore expect to experience more recruitment issues for offshore wind farms based on the limited opportunities to develop experience and skills. It should be noted that although there are no current offshore developments specifically related to Northern Ireland, the peripatetic nature of engineers in the sector would not preclude the development of these skills in the Province.

4.1.3 Offshore licence release

The Crown Estate announced which companies were successful in obtaining the rights to develop the 9 new offshore generation sites on 8th January 2010. Once built, the sites will multiply Europe's existing offshore wind generation capacity by ten. Following this initial agreement, the developing partners must now understand each site's generation feasibility, financing, design and construction issues and seek planning and consent, all of which requires specialist skills, ranging from high level technical expertise through to project management, business skills and communication.

These stages can take several years before construction can begin and the sites begin to generate power. Release 1 was launched in 2000 and featured 17 sites for development. To date only 7 are fully operational and 4 others are still in development. Release 2 was launched in 2003 with 15 sites, three of which are now under construction. As such it can be difficult to construct a realistic time-line of which skills (development, planning, construction, O&M, support services etc) are required and when – influencing resource planning.

The UK currently has a 44% share of the offshore wind market in Europe while Denmark is second with 30%. Yet it is interesting that of the 12 companies granted development rights in the Crown Estate's third release, only four are UK based. The companies winning the tenders for the UK wind farm development zones include Vattenfall (Sweden), EDP (Portugal), RWE and E-ON (both German), Mainstream (Ireland), Statkraft and StatoilHydro (Norway), Siemens (Denmark), and RES, Centrica, Scottish and Southern Energy, and Sea Energy (all from the UK). It will be interesting to understand how this will affect site planning, development, construction and operations and maintenance in the years to 2020.

4.2 Key Stakeholders

This section of the report provides a brief overview of some of the key organisations, government bodies and industry groupings which have a stake in the large scale wind energy sector. There are a wide variety of stakeholders given the breadth and scope of the rapidly growing renewables sector, crossing, for example, a number of government bodies and Sector Skills Councils. Each of these organisations has a key role to play in securing a sufficient and sustainable supply chain of skilled workers for the large scale wind energy sector.

4.2.1 Energy and Utility Skills

Energy and Utility Skills is the Sector Skills Council responsible for the gas, power, waste management and water industries and, therefore, inherent within the footprint is a substantial portion of the Renewables sector. Within the UK Power industry, EU Skills aims to help employers identify their skills needs and to establish itself as a focal point for industry and Government working together to ensure an adequate supply of people with the right skills and qualifications to support the success of business. EU Skills has joined forces with the power industry's Power Sector Skills Strategy Group (PSSSG) to set up the National Skills Academy for Power (NSAP), an organisation devoted to providing national, strategic planning across the UK. With the development of the Renewable Energy Apprenticeship Programme, National Occupational Standards for Power for the wind energy sector and relevant qualifications for wind technicians, EU Skills is at the fore in promoting enhanced skills and training provision in the large scale renewables sector.

4.2.2 ConstructionSkills

ConstructionSkills is the Sector Skills Council and Industry Training Board responsible for the construction industry, working to deliver a safe, professional and fully qualified UK construction workforce. A sufficient workforce appropriately skilled to construct both on and offshore wind turbines and associated facilities will be essential if the UK is to meet its renewables targets and commitments.

4.2.3 Semta

Semta is the Sector Skills Council for Science, Engineering and Manufacturing Technologies. Semta supports UK businesses in achieving global competitiveness through investment in skills. Semta covers manufacture, marine technologies and electrical engineering – all required in the large scale

wind energy industry, skilled to the highest levels to enable the UK to compete on the global renewable energy market.

4.2.4 SummitSkills

SummitSkills is the Sector Skills Council for the building services engineering sector. The building services engineering sector has a major role to play in meeting the carbon reduction targets set by Government. Reducing emissions, lowering energy consumption and conserving water cannot be achieved unless this sector designs, installs and maintains renewable and environmental technologies. There is a huge challenge ahead for employers to have the right skills in place to adapt and respond to new system designs and working practices.

4.2.5 UK Government: Department of Energy and Climate Change (DECC)

The Department of Energy and Climate Change is responsible for all aspects of UK energy policy, and for tackling global climate change on behalf of the UK. The work of DECC is divided into four main areas:

- Global climate change and energy
- UK energy supply
- Supporting consumers
- A low-carbon UK

DECC works to ensure that the right legislative framework is in place to meet policy objectives: reducing greenhouse gas emissions in the UK, confirming global commitments to tackle climate change, and ensuring secure, affordable energy supplies. The Department has taken three Bills through Parliament, which are now the Energy Act 2008, the Climate Change Act 2008 and the Energy Act 2010. The Climate Change Act 2008: Impact Assessment was updated in March 2009 to reflect the Act's final contents.

4.2.6 Regional Government: Department for Employment and Learning (DEL)

The Department for Employment and Learning has lead responsibility in Northern Ireland for the promotion of learning and skills to prepare people for work and to support the economy. DEL is contributing to the development of the renewables sector by addressing skills issues. It can play its part in terms of ensuring that the educational sectors which it supports have the capacity and ability to address the skills needs of these emerging industries, in the Further Education (FE) sector. This

also includes increasing the capacity of research and development in the Higher Education (HE) sector.

4.2.7 Local Government: Department of Enterprise, Trade and Investment (DETI)

A Strategic Environmental Assessment (SEA) is being undertaken for the Department of Enterprise, Trade and Investment (DETI). This will enable a better understanding of the environmental impacts from wind, wave and tidal energy development around the coast of Northern Ireland. The SEA will also help shape planning guidance and steer project developers to the best sites for device deployment. DETI is currently preparing a Strategic Action Plan for the future development of offshore wind and marine renewable energy. The results from the SEA will be used to assist DETI with the ongoing development of the Strategic Action Plan, which is due to be completed by 2010. The Department of Enterprise, Trade and Investment has launched a statutory consultation on proposed changes to the Northern Ireland Renewables Obligation (NIRO) for implementation by 1st April 2011 and other changes on which initial views are being sought.

4.2.8 Local Government: Inter-departmental Working

The Sustainable Energy Inter-departmental Working Group (SEIDWG) was mandated by the NI Executive, and is chaired by the DETI Minister Arlene Foster. It was set up to demonstrate a strategic, joined-up Government approach to Sustainable Energy issues in Northern Ireland, where many Departments have legislative responsibility for energy efficiency and renewable energy matters. The establishment of this group provides a clear message to stakeholders that the NI Executive recognises the opportunities and challenges presented by sustainable energy issues, and that this area presents a real opportunity for 'green job' creation in Northern Ireland.

4.2.9 RenewableUK

RenewableUK (formerly the British Wind Energy Association – BWEA) is the trade and professional body for the UK wind and marine renewables industries. Formed in 1978, and with 623 corporate members, RenewableUK is the leading renewable energy trade association in the UK. In 2004, RenewableUK expanded its mission to champion wave and tidal energy and use the Association's experience to guide these technologies along the same path to commercialisation. RenewableUK's primary purpose is to promote the use of wind, wave and tidal power in and around the UK, acting as a lobbying group to promote wind energy and marine renewables to government, industry, the media and the public. They research and find solutions to current issues and generally act as the forum for the UK wind, wave and tidal industry. They provide information on jobs and courses available to people keen to embark on a career within the sector, and are pushing forward with the

skills and training agenda through their Skills Summits and support for the Renewable Energy Apprenticeship Programme.

4.2.10 Irish Wind Energy Association

IWEA is the national association for the wind industry in Ireland. It comprises two divisions: one committed to the promotion and education of wind energy issues and the second, charged with conference organisation, lobbying and policy development. IWEA is committed to promoting the use of wind energy in Ireland and beyond as an economically viable and environmentally sound alternative to thermal or nuclear generation. The organisation operates Wind Skillnet, a programme funded by member companies and also operates The Training Networks Programme, an initiative of Skillnets Ltd, funded from the National Training Fund through the Department of Education and Skills. Wind Skillnet has conducted extensive training needs analysis with its member companies, worked closely with IWEA and taken guidance from leaders in the Irish Wind Industry to develop a suite of courses that will meet the requirements of trainees in the Wind Industry through 2010. The courses cover a range of topics range from turbine operation, maintenance and productivity, finance, planning, grid connection and wind monitoring among others.

4.2.11 The Crown Estate

The Crown Estate is the organisation, established by Parliament, to manage the hereditary estates of The Crown on behalf of the nation. The responsibilities of The Crown Estate are to maintain and enhance the value of the estate and its income over the long term and to do this having regard to good management. The profit earned by The Crown Estate is paid to the Treasury for the benefit of the nation. The marine estate includes around half of the UK's foreshore, the beds of tidal rivers and estuaries and almost the entire seabed out to the 12 nautical-mile territorial limit around the UK. It also includes the rights to explore and utilise the natural resources (excluding hydrocarbons) of the UK continental shelf. At the beginning of 2010, The Crown Estate announced the successful bidders for Round 3 of their offshore wind programme, and those for the world's first commercial wave and tidal programme. To put the scale of the opportunities into context, Round 3 could provide 25% of the UK's electricity by 2020.

4.2.12 Renewable Energy Association (REA)

The REA represents the UK's renewable energy sector, covering all renewable power heat and fuels. The REA was established in 2001 to represent British renewable energy producers and promote the use of sustainable energy in the UK. The REA was called the Renewable Power Association until October 2005. Their membership is active across the whole spectrum of renewables: electric power,

heat and bio-fuels. REA represents a wide variety of organisations, including generators, project developers, fuel and power suppliers, equipment producers and service providers. Members range in size from major multinationals to sole traders. REA has a membership of more than 500.

4.2.13 Sustainable Energy Authority of Ireland (SEAI)

The Sustainable Energy Authority of Ireland (SEAI), formerly the Irish Energy Centre was set up by the government in 2002 as Ireland's national energy authority. The Renewable Energy Information Office of the Sustainable Energy Authority of Ireland was established to promote the use of renewable resources and provide independent information and advice on the financial, social and technical issues relating to renewable energy development. SEAI activities include consultation and promotion of renewable energy information, addressing obstacles to renewable energy development.

4.2.14 Action Renewables

Action Renewables is the lead organisation in Northern Ireland in the promotion and development of renewable energy. Action Renewables delivers a large portfolio of programmes including general awareness raising and seminars, performance monitoring of technologies, research and evaluation and lobbying.

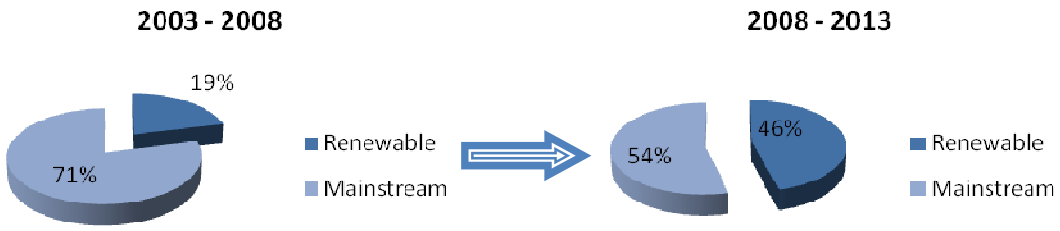
4.3 The Current Economic Climate

It is important to understand how the current economic climate – both locally and globally – impacts on the renewable energy sector. At the time of the report, the UK was emerging from a recession, which has caused the new coalition government in the UK to announce significant cutbacks, particularly in the public sector. Understandably, there has been a fear that this could put investment in meeting renewable energy targets on hold. Additionally, many businesses have seen a rise in supply chain costs, while developers have struggled to secure financing for new projects.

However this is not the full picture. The reality of the economic situation has been in many ways favourable to the renewable energy sector, with both the government and industry identifying opportunities arising from the economic difficulties. Speaking via videolink to the RenewableUK Offshore Wind Conference in June of this year, Chris Huhne, the Secretary of State for Energy and Climate Change commented:

"I am committed to ensuring you have the right incentives for low-carbon growth. The offshore wind industry can be a key player in creating the investment, exports and jobs we need to bring back economic prosperity... We will continue to provide clear signals to the market through the Renewable Obligation and Feed In Tariffs for example. We are committed to maintaining banded Renewable Obligation Certificates (ROCs) and any move to a FIT will be done with the aim of ensuring that the UK is best placed to meet 2020 targets, protecting both investors and consumers."[4]

For some companies, their response to an uncertain economic situation and rising energy costs has been to re-organise and re-deploy their spending, taking the opportunity to invest more heavily in renewable energy as the way to hopefully secure and future-proof economic growth. For example, Scottish and Southern Energy are planning a proportionally much higher investment in renewable technologies.



Scottish and Southern Energy project that investment in renewables will be 2.5 times greater by 2013 than it was in 2008.[5]

4.4 Skills Environment

While the UK Government anticipates that the UK wind energy sector will require 70,000 jobs by 2020, a report by Bain & Company adopts a more conservative estimate of 36,000 jobs based on a "solid progress" scenario.[6] The majority of positions are expected to be in construction, design and manufacture with a small percentage of sustainable operations and maintenance positions. In November 2010, RenewableUK and EU Skills will be publishing a study analysing Labour Market

[4] http://www.decc.gov.uk/en/content/cms/news/renukcon10/renukcon10.aspx
[5] NI Energy and Environment Conference October 2009, Presentation by Mark Ennis, SSE Renewables
[6] Bain report

Information from across England, Wales, Scotland and Northern Ireland. This will provide an update to Bain and a valuable resource.

The IWEA/Deloitte report into Jobs and Investment in the Irish Wind Industry suggests an employment potential of almost 11,000 in Ireland by 2020.[7]

The importance of developing a sustainable pool of potential recruits should be emphasised; if projected figures with regards to new jobs in the industry are realistic, employers suggest that sideways movement from other industries will be insufficient to keep up with demand. This will create an attractive environment for those leaving education, who will seek suitable courses with adequate training facilities to meet the range of positions available in the sector.

Opening the BWEA Skills Summit in 2009, Chief Executive Maria McCafferty commented:

"The task ahead of our sector is enormous, as are the opportunities if just half the manufacturing for the next generation of offshore wind farms takes place here in the UK then this industry will grow 10-fold from just 6,000 jobs today to 60,000 by 2020. But in order to attract the investment and build that industry we need to have a skilled workforce ready to work in the sector. However, today we are already suffering from a growing shortage of qualified technicians and professional engineers."[8]

4.4.1 National Occupational Standards for Power

In September 2007, Energy and Utility Skills in association with BWEA embarked on the process of reviewing the power sector's National Occupational Standards for Power (NOS). The Standards are a proactive, competence-based framework aimed at describing the skills, knowledge and understanding needed to undertake tasks to a nationally recognised level. UK based organisations will use the standards to ensure activities are carried out competently and safely.

Organisations based in Ireland are perhaps also likely to use the IWEA Wind Skillnet. This is an initiative aimed at delivering relevant structured subsidised training. Wind Skillnet is a course-driven solution guided by employer requests for training. Organisations operating in Northern Ireland therefore fall under both the RenewableUK and IWEA jurisdictions. It will be important to have qualifications that can be recognised across all jurisdictions: Northern Ireland, Great Britain and the Republic of Ireland.

The majority of skills needed in the renewables sector are not new, however the combination of these skills required may be new. The training most likely already exists in a form; the core issue

[7] Deloitte report
[8] http://www.bwea.com/media/news/articles/pr20091021-2.html

therefore is to apply the training in a wind energy context. Generally, skills for the sector can be split into two main groups:

> **New renewables skills:** Skills needed in the development, construction and operation of renewable technologies, and which do not currently exist outside of the renewables sector, and;
>
> **Transferable renewables skills:** Skills needed in the development, construction and operation of renewable technologies, and which are similar to skills already existing outside the sector and require minimal additional training for transfer to the renewables sector.

This report examines both groups to identify their current level of provision.

4.4.2 UK Skills Environment

Given the relative youth of the Wind Energy sector, the development of education and training provision in the field has been fairly recent. For example, it was not until 2006 that the UK's first ever 'Renewable Energy' students graduated (University of Exeter, BSc Renewable Energy). From the early 1990s, existing engineering and building/construction programmes began to incorporate teaching on and modules in aspects of energy generated from renewable sources. Since then, in line with the extensive growth and expansion of the sector, more courses and degrees directly relevant to renewable energy, and especially wind energy, have been introduced by UK universities and colleges.

The importance of developing a sustainable pool of potential recruits should be emphasised; employers suggest that sideways movement from other industries will be insufficient to keep up with demand. This will create an attractive environment for those leaving education, who will seek suitable courses with adequate training facilities to meet the range of positions available in the sector.

At a degree level, the focus of many of these courses remains broad, for example providing a broad electrical engineering degree with the addition of specialist modules specific to electrical engineering within the context of an on-shore or off-shore wind farm. Now it is possible to do a dedicated undergraduate or post graduate renewable energy degree made up of IT, electronics, mathematics, engineering, geology, and other natural and physical sciences and/or as a joint-honours programme with electronic engineering, engineering, and mechanical engineering. However, there are an increasing number of specialised courses, particularly at a post-graduate level.

Further Education Colleges offer a wide variety of relevant programmes with qualifications ranging from diplomas and HNDs through to Foundation Degrees.

In the North East of England, a consortium of interested parties – representing business and education – recognising the potential skills gap looming and the need to meet the increasing demand for suitably qualified and skilled technicians, have collaborated to bring about the UK's first Wind Turbine Training Tower, to be used by education and training providers to deliver training programmes for wind farm technicians. This partnership brings together Northumberland College, Mainstream Renewable Power and Narec, supported by the Regional Development Agency, One North East. The tower is 27 metres high and will provide direct hands on experience in working at height and on a working wind turbine. Those involved in the project anticipate that the North East of England will become a region of excellence and a global hub for training in this industry.

"The Training Tower will help to ensure that the students on the wind technician training programme at Northumberland College are trained to British and European industrial standards. The specification of the tower and the equipment within it will allow us to develop new training modules which will enable us to meet the skills needs of the wind energy industry."[9]

"The creation of the wind turbine training tower and the training partnership developing between Narec, Northumberland College and Mainstream will ensure the North East has skills to capitalise on the £100bn investment that will be made over the next decade."[10]

The region has a long history in engineering, and geographically is well placed to maximise on offshore developments resulting from the Round 3 Crown Estate release. Its heritage in shipbuilding and the steel industries also means that as well as training recent school leavers or graduates, those who wish to move sideways from a related industry with skills in engineering or construction can up-skill through their access to the facilities at Narec.

Arguably, this is a context which is very similar to that in Northern Ireland, with its rich industrial history in shipbuilding, aerodynamics, and steel through companies such as Harland and Wolff, Bombardier, and Shorts. Equally, with a reputable harbour in Belfast and notable education establishments it may be that the developments in the North East of England can guide and inform policy and practice in the province.

[9] Rachel Ellis-Jones, Principal and Chief Executive of Northumberland College, http://www.narec.co.uk/media/news/n/successful_collaboration_launches_new_wind_training_facility_in_the_north_east_/

[10] Ian Williams, Director of Business and Industry at One North East, http://www.narec.co.uk/media/news/n/successful_collaboration_launches_new_wind_training_facility_in_the_north_east_/

4.5 Sector Drivers

4.5.1 Important policies

In order to understand the influences in the sector, it is important to be aware of the relevant frameworks and legislation. Listed below are a few of the policies which are key to driving growth in the renewables sector and setting targets for renewable energy generation.

- Kyoto Protocol, 1997
- European Renewables Policy, December 2008
- UK Climate Change Act, November 2008
- UK Low Carbon Transition Plan, 2009
- UK Energy Act, 2010
- Renewables Obligation Order, 2009
- The 'Green New Deal', August 2010

Kyoto Protocol

The Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change. The major feature of the Kyoto Protocol is that it sets binding targets for 37 industrialized countries and the European community for reducing greenhouse gas (GHG) emissions .These amount to an average of five per cent against 1990 levels over the five-year period 2008-2012. The UK is committed to achieving a 12.5% reduction in greenhouse gas emissions by 2012.[11]

European Renewables Policy

European leaders signed up in March 2007 to a binding EU-wide target to source 20% of their energy needs from renewables, including biomass, hydro, wind and solar power, by 2020. To meet this objective, EU leaders agreed a new directive on promoting renewable energies, which set individual targets for each member state. The UK's proposed target is 15% by 2020, because the UK was behind many other EU countries in the area of renewable energy supply.[12]

[11] http://unfccc.int/kyoto_protocol/items/2830.php
[12] http://www.euractiv.com/en/energy/eu-renewable-energy-policy-linksdossier-188269

UK Climate Change Act

The Climate Change Act 2008 makes the UK the first country in the world to have a legally binding long-term framework to cut carbon emissions. It also creates a framework for building the UK's ability to adapt to climate change. The Act aims to enable the United Kingdom to become a low-carbon economy and gives ministers powers to introduce the measures necessary to achieve a range of greenhouse gas reduction targets. An independent Committee on Climate Change has been created under the Act to provide advice to UK Government on these targets and related policies.[13]

Low Carbon Transition Plan and UK Energy Act

The *UK Low Carbon Transition Plan*, published July 2009, outlines the policies and proposals that will be put in place to decarbonise the UK economy to achieve an 18% reduction on 2008 levels (34% on 1990 levels) in carbon emissions by 2020 and a 7-fold increase in energy from renewable sources over the same period. The Transition Plan acknowledges the importance of cutting emissions sustainably. This means ensuring our energy needs continue to be met and ensuring the costs (especially those borne by the most vulnerable households) of moving to a low carbon economy are shared on a fairer basis. It also means ensuring that we maximise the economic opportunities for UK businesses to develop and sell the green technologies of the future. The Transition Plan is being taken forward through a broad programme of activities and new measures, both legislative and non-legislative. The Energy Bill will take forward important elements of the Plan related to decarbonising the power sector by facilitating the demonstration of commercial scale Carbon Capture and Storage (CCS) and improving the fairness of the energy markets through the implementation of mandated social price support and other amendments to strengthen the powers of the Government and Ofgem (the regulator) in order to better protect consumer interests.[14]

Renewables Obligation

The Renewables Obligation (RO) is designed to encourage generation of electricity from eligible renewable sources in the United Kingdom. It was introduced in England and Wales and in a different form in Scotland in April 2002 and in Northern Ireland in April 2005. The RO places an obligation on licensed electricity suppliers in the United Kingdom to source an increasing proportion of electricity from renewable sources, similar to a renewable portfolio standard. In 2010/11 it is 10.4% (4.0% in Northern Ireland). This figure was initially set at 3% for the period 2002/03 and under current

[13] http://www.defra.gov.uk/environment/climate/legislation/

[14] http://www.decc.gov.uk/assets/decc/legislation/energybill/1_20100226093333_e_@@_energybillfactsheetsummary.pdf

political commitments will rise to 15.4% (6.3% in Northern Ireland) by the period 2015/16 and then it runs until 2037 (2033 in Northern Ireland). The extension of the scheme from 2027 to 2037 was declared on 1st April 2010 and is detailed in the National Renewable Energy Action Plan. Since its introduction the RO has more than tripled the level of eligible renewable electricity generation (from 1.8% of total UK supply to 5.4% in 2008). Suppliers meet their obligations by presenting Renewables Obligation Certificates (ROCs).[15]

Green New Deal

In August 2010, Deputy Prime Minister Nick Clegg announced plans for a new 'Green Deal' for households and businesses. The Green Deal will combine growth in the economy with a greener and more efficient way of using energy. It aims to reduce energy demand and carbon emissions while making homes warmer, saving consumers money and stimulating green recovery in jobs. Clegg promised that the coalition government would oversee a *"quiet green revolution"* that avoids *"green gimmicks"* and instead focuses on delivering low carbon jobs. [16]

In the Coalition's first annual energy statement to the Commons, Chris Huhne, the Energy Secretary, outlined plans to transform Britain's power system and cut carbon emissions by 80 per cent within the next 40 years. He announced 32 separate measures, from the use of smart meters in all homes to a major expansion of renewable energy sources, including a new generation of nuclear power stations and up to 44,000 wind turbines.

4.5.2 Influencing factors

In order to understand the influences in the sector, it is important to be aware of the relevant frameworks and legislation. Listed below are some additional factors which should be appreciated when considering how the sector is shaped and driven.

- Planning permission (Ecology, landscape, and noise pollution, public perception*)*
- Grid access and upgrades
- Changing patterns of energy consumption

[15] http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewable/policy/renew_obs/renew_obs.aspx
[16] http://www.guardian.co.uk/environment/2010/aug/19/clegg-coalition-green-deal

Planning permission

Wind Farms cannot be constructed or extended without appropriate planning permission in place. Achieving planning permission can be a difficult process, with applications having to take into consideration ecology, animal habitats, landscape, electromagnetic effects and potential local opposition from people who are concerned by the prospect of noise or landscape pollution. This gives rise to a need for appropriate skills and communication to identify and deal with site related issues and address local opinion.

Grid access and updates

Even with planning permission in place, wind farms are ineffectual unless they can be connected to the grid. It is important that the necessary infrastructure is in place to enable wind farms not just to generate energy, but also for this energy to be used to supply electricity and power, requiring an effective connection route. While ancillary in nature, employers are right in pointing to the need for a skilled workforce to maintain and update grid access and connections.

Greater wind penetration will require enhanced infrastructure and demand side management to facilitate electricity generation from this source. Interconnectors provide an important role in both balancing and supplying areas of Ireland with electricity. Unfortunately, they are currently insufficient to meet the demands of large scale wind operation as they do not provide the import and export potential to cope with the highly variable supply and demand.

In March of this year, the government released long-awaited proposals to reform the grid connection regime in the UK and tackle the bottlenecks that have delayed the opening of numerous wind farms. The proposals – *'Connect and Manage'* - aim to speed up the time it takes to connect new energy generation projects to the grid, on the understanding they will then closely manage their energy output to ensure they stay within grid capacities.

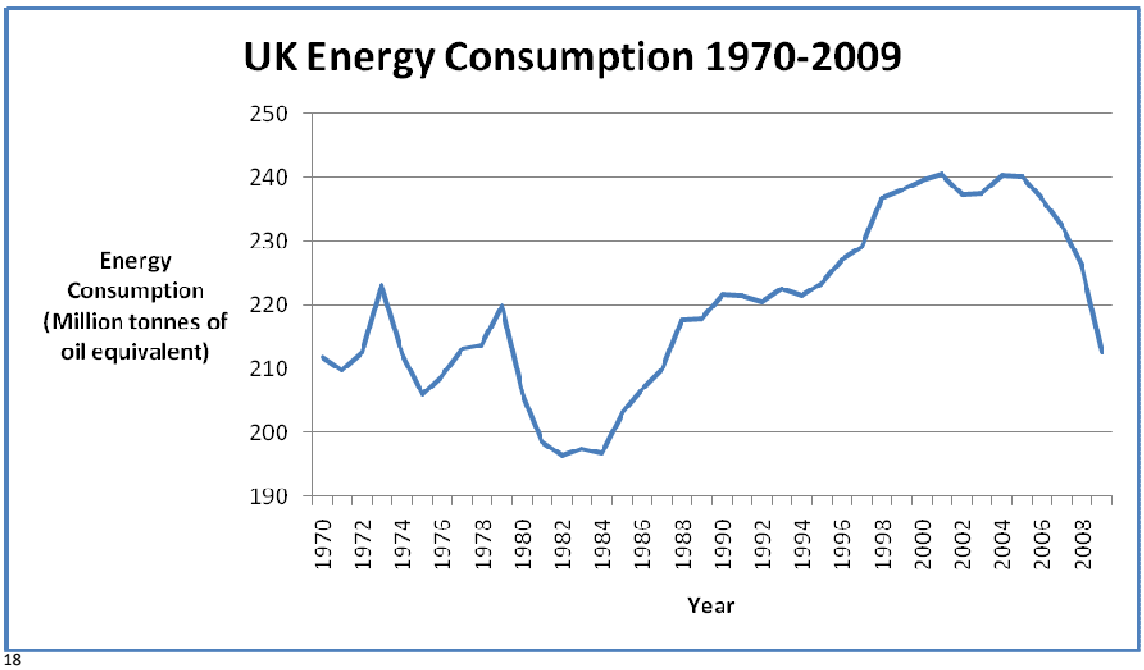
Then Energy minister David Kidney said the changes to grid connection rules would particularly benefit renewable energy projects, many of which are found in remote locations and, as a result, have faced major difficulties securing grid connections.

"Access to the electricity grid has been one of the key barriers to the generation of renewable energy in this country".[17]

[17] http://www.businessgreen.com/business-green/news/2258944/government-targets-renewables

Changing Patterns of Energy Consumption

Research carried out by the United Nations Committee on Sustainable Development in 1996 revealed that energy use was expected to increase by fifty percent over the next 25 years, and two-thirds of that increase is expected in developing countries. While energy consumption in the UK increased significantly from the early 1980s to the early part of this century, since 2006, energy consumption has begun to decline, as industry and consumers become increasingly aware of their energy usage and keen to limit it – both for cost and environmental reasons. This is depicted in the chart below.



[18]

An interesting point to consider however is that the development of new technologies – such as electrically powered vehicles – could actually create an additional demand for power.

Among the public, according to a November 2005 poll conducted by YouGov for Deloitte, 35% of the population expect that by 2020 the majority of electricity generation will come from renewable energy (more than double the government's target, and far larger than the 5.5% generated as of 2008).

[18] Chart produced using Government Statistics: Department of Energy and Climate Change – Digest of UK Energy Statistics Annex, Table 1.1.2 and Table 1.1.4

An important consideration is that this report only concerns large scale wind energy generation. The Governments Feed-In Tariff (announced April 2010) is expected to fuel and increase in micro generation through small and medium scale photovoltaic and wind energy generation, which although small, will have some impact on the amount of electricity generation from renewable sources. Importantly, there is also very significant potential for energy generation resulting from the growth and expansion of marine and tidal technologies.

Energy efficiency and renewable energy are said to be the "twin pillars" of a sustainable energy policy. Both strategies must be developed concurrently in order to stabilise and reduce carbon dioxide emissions. Efficient energy use is essential to slowing the energy demand growth so that rising clean energy supplies can make deep cuts in fossil fuel use. If energy use grows too rapidly, renewable energy development will chase a receding target. Likewise, unless clean energy supplies come online rapidly, slowing demand growth will only begin to reduce total carbon emissions; a reduction in the carbon content of energy sources is also needed. A sustainable energy economy thus requires major commitments to both efficiency and renewables.[19]

[19] The Twin Pillars of Sustainable Energy: Synergies between Energy Efficiency and Renewable Energy Technology and Policy (American Council for an Energy-Efficient Economy)

5.0 Northern Ireland Renewables Landscape

"...We firmly believe that Northern Ireland has the potential to punch above its weight in the renewable energy sector."[20]

Northern Ireland is well placed to become a strong skills developer and skills exporter in the field of large scale wind energy generation globally. The region can depend on a consistently reliable supply of wind. The province has a long tradition of exceptional education, and coupled with our industrial heritage there is a strong platform on which to build Northern Ireland as a region of excellence in skills and training in the large scale wind energy sector.

5.1 Legislative landscape and targets

The Sustainable Development Strategy launched in May 2006 by the Office of the First and Deputy First Minister commits Northern Ireland to a 25% reduction of greenhouse gas emissions by 2025.

The introduction of the Renewables Obligation in April 2005 promotes the use of renewable energy.

Planning Policy Statements increasingly reflect the need to lessen emissions and adapt to climate change impacts. In 2008, the Department of the Environment (DOE) published for consultation a planning statement 18 (PPS 18) on renewable technologies. This was an important development, as delays in the planning process have frustrated renewable developers in Northern Ireland.

A £59 million Environment and Renewable Energy funding package was launched in February 2006 to January 2008, for research and development on renewable technologies in Northern Ireland.[21]

In the January 2008 publication of a North-South study on renewable energy and the electricity grid ('The Grid Study'), the Minister for Enterprise Trade and Investment, Nigel Dodds, commented;

"Northern Ireland can make a significant contribution to the UK's climate change goals by enhancing the amount of electricity generated from local renewable sources...it is clear that we must be more ambitious in setting future renewable energy targets".[22]

[20] Mark Ennis, Airtricity Action Renewables factsheet
[21] Action Renewables Factsheet page 23
[22] Action Renewables Factsheet page 57

From a public policy perspective, the Department for Employment and Learning (DEL) subscribes fully to the Sustainable Development Strategy for Northern Ireland. In funding the current research, DEL is demonstrating its commitment both to the advancement of the Northern Ireland skills landscape, and also to the promotion of renewable energy solutions. Other local government departments are also positioning themselves to support the renewables sector, for example at the end of 2009 the Department of Enterprise, Trade and Investment (DETI) published a consultation document entitled 'Draft Offshore Renewable Energy Strategic Action Place 2009-2020 and Strategic Environmental Assessment' which can be accessed through their dedicated website: www.offshorenergyni.co.uk. In drafting this document, representatives on the Project Steering Group came from DETI, and also from the Department of Agriculture and Rural Development, the Department of Environment and the Department for Regional Development.

Other organisations operating within, promoting and supporting the sector in Northern Ireland include Action Renewables and the various Sector Skills Councils. There is a wide consensus within the province – amongst government departments, public bodies and private organisations – that Northern Ireland should position itself to take advantage of developments within the renewables sector – both from a job creation and economic perspective, and because there is a growing recognition that this is essential to safeguard the environmental future.

5.2 Companies operating in Northern Ireland

The companies operating in the industry are either young and newly developed, or established companies diversifying into the new market with specific wind-energy divisions. All companies regardless of their stage of development are operating in a dynamically changing environment where technology competence is growing.

Young organisations have the expected growth issues facing successful companies in a rapidly growing market. However larger companies are also facing growth issues including company attractiveness, accessing up to date training, multi-discipline job descriptions, job life-cycle and promotion paths and sourcing the right person for the job in a sector where change is a constant and the right person for the job does not exist.

These organisations are operating in an environment where few people have the desired skills, fewer have the necessary experience, and recruitment can be difficult. Recruiting someone with the necessary competence that has the additional softer business skills has been reported to be more difficult again.

5.3 Education and training in Northern Ireland

Northern Ireland's Universities and Colleges are recognised as centres of high-quality teaching, and ground-breaking research programmes in a variety of disciplines, including renewables. An example of this would be the ground-breaking work of Professor Trevor Whittaker at Queen's University Belfast, into tidal energy research; as head of the Wave Power Research Centre and a world-renowned expert on wave power and coastal engineering, he has led on several innovative projects, including the design, construction and operation of Britain's first wave power station located on the Isle of Islay.[23]

Higher Education in Northern Ireland is delivered through:

- The Queen's University of Belfast
- University of Ulster

Further Education is delivered regionally through:

- Belfast Metropolitan College
- Northern Regional College
- North West Regional College
- Southern Regional College
- South Eastern Regional College
- South West College

The Northern Ireland Sustainable Development Strategy, published in May 2006 by the Office of the First and Deputy First Minister, presents a vision of a sustainable Northern Ireland:

"Northern Ireland would be recognised as a world leader in environmental technologies and in particular in renewable energy."[24]

In order to attain this vision, the importance of a Further Education Strategy is emphasised.

[23] http://space.qub.ac.uk:8077/EERC/Whittaker/default.aspx
[24] http://www.ofmdfmni.gov.uk/sustain-develop.pdf, Page 16

5.4 Northern Ireland's Industrial Heritage

Northern Ireland has a long history of engineering and industry. Belfast, with its harbour at the mouth of the River Lagan was an ideal location for the shipbuilding industry, dominated by the Harland & Wolff Company. Other manufacturers such as Shorts and Mackies also required workers skilled in engineering and mechanics. While some of this industry has seen a decline in the post-WWII years, there has been a recent resurgence in the prosperity of the shipyards, that have diversified into emergent offshore wind technologies and tidal power constructions. In June 2008, Harland & Wolff assembled 60 Vestas V90-3MW wind turbines for the Robin Rigg Wind Farm. This was the second offshore wind farm assembled by the company for Vestas. This demonstrates the sideways movement that companies can make from one industry into another, related industry, just as individuals working within these industries can use their transferable skills and apply them in another sector – for example, moving from mechanical and electrical engineering into the large scale wind energy sector, or from off-shore shipbuilding to off-shore wind farm construction.

5.5 Updating the Northern Ireland Grid

The Northern Ireland electricity grid requires major investment to bring it up to the necessary capacity for the wind farms planned and required to meet wind energy generation targets set.

In 2006 Airtricity unveiled their vision of a pan European offshore 'Supergrid' across Europe which would see the construction of an integrated grid of wind-farms across the North Sea, Baltic Sea, Bay of Biscay, St George's Channel, the Irish Sea, the Mediterranean as well as along Ireland's Atlantic seaboard. **(SEE DIAGRAM BELOW)**

The Supergrid is designed both to supply energy generated by wind-turbines and to act as a transmission network to deliver electricity across Europe, increasing the efficiency of the market. This should also ensure that - once the grid is fully operational - Europe can access wind energy at all times as the wind will always be blowing somewhere on the grid. This will increase both energy security, and the level of total energy generated by wind. There is considerable political support for the Supergrid across Europe.[25]

5.6 The offshore wind opportunity

"Northern Ireland is fortunate to have considerable offshore renewable energy resources, a strong engineering and manufacturing base and significant port and harbour facilities to enable the successful development of an offshore renewable energy sector."[26]

5.6.1 Offshore wind farms

The offshore wind potential for Northern Ireland is beginning to be realised. The Department of Enterprise, Trade and Investment (DETI) is currently preparing a Strategic Action Plan for the future development of offshore wind and marine renewable technology which is due for completion later this year. A Scoping Report was issued for consultation in April 2009. The main objectives of the report (or Strategic Environmental Assessment) include:

- Assessing and quantifying the potential of offshore wind and marine renewable energy to contribute to overall UK and EU renewable energy targets for 2020.
- Informing the project level decision making process for all stakeholders (wind farm developers, operations and maintenance companies, planners etc)
- Facilitating focused investment in offshore wind and marine renewable energy developments in Northern Ireland.

A number of studies undertaken over the last few years have demonstrated that Northern Ireland has a real potential for offshore wind. In June 2002, the Crown Estate granted a lease to a consortium (comprising B9 Energy Offshore Ltd, Powergen Renewable Developments Ltd, and Renewable Energy Systems Ltd) which assessed the feasibility of developing a 28km^2 seabed site on the Tunes Plateau, 5km off the North coast of Northern Ireland. The project is still at the

[25] Action Renewables Factsheet page 35
[26] Consultation on an Offshore Renewable Energy Strategic Action Plan 2009 – 2010, Forward by Arlene Foster, Minister for Enterprise, Trade and Investment

development stage – but with the installation of between 50 and 85 offshore wind turbines being considered, could lead to the generation of up to 250 MW of electricity.[27] In 2003, Airtricity unveiled proposals for a 200 MW offshore wind development off the coast of Northern Ireland at Kilkeel.[28] In a 2009 Conference on Northern Ireland Energy and Environment, Mark Ennis of Scottish and Southern Energy outlined what he saw as the potential for Belfast to become an industrial hub; an offshore wind port, a key player in the global offshore supply chain.

The core objective of the Draft Strategic Action Plan 2009-2020 is to put in place steps to ensure the optimisation of renewable electricity generated from offshore wind in Northern Ireland's water (defined as up to 12 nautical miles from the coast). It is anticipated that this will enhance diversity and security of supply, reduce carbon emissions, contribute to the province's renewables targets, develop business opportunities for Northern Irish companies and promote job creation. The Strategic Action Plan (SAP) will include actions to maximise the opportunities for Northern Ireland companies in the development of offshore renewables, not just off Northern Irish coasts, but across the UK and further afield – ensuring that they are well placed to make the most of the offshore wind energy market in terms of new business and employment opportunities.

The SAP sets targets for at least 600 MW of offshore wind to be developed in Northern Irish waters by 2020. DETI is actively engaging with the Crown Estate to roll out a competitive call for commercial projects in Northern Ireland's waters in 2010-11.

This report is based not only on the skills needs of industry today, but on projected needs for the future and as such it is important to consider what skills and training might be required if Northern Ireland is to maximise on the opportunities of the offshore wind sector.

[27] Strategic Environmental Assessment (SEA) of Offshore Wind and Marine Renewable Energy in Northern Ireland. Final Scoping Report. Department of Enterprise, Trade and Investment (DETI) April 2009 page 16
[28] Ibid

5.6.2 Harland & Wolff: Offshore wind port

In February of this year, Nick Clegg – now Deputy Prime Minister – announced plans to upgrade disused shipyards into centres for the production of off-shore wind turbines. He suggested that these proposals would not only facilitate the UK meeting their energy produced from renewable sources targets, but also generate significant job creation.

Arguably, Northern Ireland can bypass these upgrade plans and invest in the Harland & Wolff shipyard in Belfast. Harland & Wolff Heavy Industries Ltd is already involved in the sector, in particular manufacturing jackets for offshore wind turbines, while in 2008, 60 wind turbines were prepared for installation at the Robin Rigg offshore wind farm in the Solway Firth on the border of England and Scotland.

Wind turbines being prepared by Harland & Wolff Heavy Industries for installation at the Robin Rigg offshore wind farm.

Harland & Wolff are keen to expand further into logistics and assembly, and increasingly are quoting for the manufacturing of wind farms – manufacturing everything excluding the actual turbine, the manufacture of which is not currently planned (as it would require a hugely expanded plant – approximately 200,000 m^2 and additional skills from graduates that are currently not on the various curricula). As of December 2010, Harland & Wolff will be completing their third wind farm. They are keen to position Harland & Wolff as a flag flyer for Northern Ireland, helping to bring in investment and, like Mark Ennis, proposing that Belfast can and should be viewed as the entry port into Europe; Harland & Wolff is a very recognisable name which, coupled with its prime location, should support this endeavour.[29]

[29] Interview with Harland & Wolff

6.0 Broad Skills Requirements

In investigating and analysing the skills and training needs identified by employers, it proved vital to have a clear understanding of the various skills requirements for onshore and offshore wind which we have divided into four core activities:

- Research, development and planning
- Manufacturing
- Installation
- Operations and maintenance

For each of these activities, the necessary requirements, skills, qualifications and experience have been outlined in table form on the following pages. For each activity area the tables show:

- Broad tasks involved
- Broad skills sets needed
- Qualifications required
- Necessary experience
- Types of training provider

These tables were sourced from the Forward Scotland report *'Skills for renewable energy in Scotland'* April 2005. Much of the general information in the report was transferable to a Northern Ireland context; however some amendments / additions have been made to the information to make them directly applicable to the current research.

Not all of these tasks will be relevant to every occupation within the sector, for example an onshore wind turbine technician will not need the qualifications required by an offshore turbine blade manufacturer. It will not be possible, nor arguably of any real benefit, to create a training course in Northern Ireland covering each of the different aspects identified below however it is valuable to outline each aspect in order that the depth and breadth of skills and experience required within the sector can be appreciated.

6.1 Onshore wind: Research, development and planning

Broad Tasks	Broad Skill Set	Qualifications	Experience	Providers
Site identification and feasibility	Meteorological, acousticians, ecologists, biologists, specialists in visual impact / modelling, power generation & connection, botanic, archaeological, ornithological, geological, topographic & hydrological assessments	Degree-level specialists in a variety of disciplines; environmental engineering	Experience of working with large projects, especially wind farms	Universities
	Engineering surveys	Degree level engineering CAD, GPS	Experience of working with wind farm projects	Universities FE colleges Private providers
	Site access & ground work assessment	Civil engineering or construction	Experience of working with large scale projects in sensitive areas	Universities
Project planning	Financial feasibility Business planning	Accountancy	Experience with large energy projects, esp. wind	Universities
	Knowledge & understanding of regulatory and legal contexts	Degree level town & country planning, surveying	Local authority (LA) planning	Universities
	Interpretation of local & national policies	Legal	LA & government planning, energy LA	Universities
Communications	Consultation with stakeholders	Marketing, public relations, promotion, legal	Marketing, promotion experience, especially with community groups	Universities
	Consultation with community			
Project Development	Project planning & management skills including interpretation of data	Degree Level civil engineering or engineering construction	Experience with civil / power construction projects	Universities
	Working to time & financial deadlines & limits	Degree level engineering	Designing engineering or power projects	Universities
	Engineering drawings	Technical Services MA CAD, GPS		FE colleges, Private providers. Employers
	Procurement & contracting	Legal & accountancy	Experience of power construction sector	Universities

6.2 Onshore wind: Manufacturing

Broad Tasks	Broad Skill Set	Qualifications	Experience	Providers
Turbine Assembly	Mechanical, electrical engineering, control & instrumentation, general engineering	Engineering Production MA Engineering Installation & Commissioning MA Technical Services MA Electrical & Electronic Servicing MA Engineering HNC, HND	Engineering production / assembly: skilled and some semi-skilled. Product-specific	FE colleges, Private providers Employers On the job for product specific
Tower manufacture Monopile manufacture	Fabrications, welding, plating	Coded welding, nondestructive test certification Fabrication & Welding MA Welding (Plate) SVQ Welding (Pipework) SVQ	Skilled crafts in heavy fabrication, e.g. oil platform construction, ship building. Product-specific	FE colleges Private providers Employers On the job for product specific
Casing and blade manufacture	Mould and pattern making Chemical and product control General engineering	Engineering Production MA	Engineering production / assembly: skilled and some semi-skilled Apprentices Product – specific	FE colleges Private providers Employers On the job for product specific
Production management	Control of whole manufacturing process: finance, HR, H&S, environmental regulations, quality control, procurement, sales, transport, etc	Degree level engineering, MIMechE or equivalent	Manufacturing management experience, possibly aeronautical	Universities

6.3 Onshore wind: Installation and Operation

Broad Tasks	Broad Skill Set	Qualifications	Experience	Providers
Project management	Implementations and delivery of wind farm project	Degree and professional qualifications	Considerable experience in oil and gas or power projects	Universities
	Range of project management skills and knowledge of sector	Construction engineering background	Considerable experience in oil and gas or power projects	Universities
Site and infrastructure and re-instatement	Management, including management of subcontractors	Civil engineering degree and professional qualifications	Considerable experience of civil engineering projects in environmentally challenging areas.	Universities
	Surveying Ground works Road and bridge building	Civil engineering degree and construction	Civil engineering projects	Universities CITB, private providers
	Heavy construction machinery operations	CPCS as relevant to specific machines	Experienced operators	CITB, private providers
	Transport – low loaders	LGV Class One	Experienced STGO (abnormal loads) drivers	Experience only
Grid connections	Surveying	Surveying degree level	Civil engineering projects	Universities
	Cable laying	Cable jointing	Experienced operators	Private providers, Employers
	Electrical / power installation and connections / telecoms	Degree level engineering HV SYSTEM operations Electricity & Distribution MA	Experienced power engineers	Universities, FE Colleges, Private providers, Employers
Wind turbine erection	Crane operators Riggers	CPCS as relevant	Previous heavy lifting operation	CITB, private providers
Testing and commissioning	Electrical and commissioning / electronic / mechanical engineering	Degree level engineering Installation and HV systems	Experience in power distribution / generation and preferably wind turbines	Universities, employers

		Installation & Commissioning MA Electricity & Distribution MA Technical Services MA		FE Colleges, private providers, employers
Maintenance of turbines	Understanding wind power generation devices	Degree or HND level electrical / mechanical engineering	Experience of maintaining turbines or similar equipment	Universities, FE colleges, manufacturer's courses
	Maintenance of devices	Degree / post graduate electrical / mechanical engineering Technical Services MA	Hydraulics and turbines	Universities FE colleges Private providers Employers
	Environmental monitoring	Degree / post graduate level environmental specialists of various disciplines	Environmental ecology	Universities
	Revenue control	Accountancy	Experience of renewable energy power schemes	Universities

6.4 Offshore wind: Research, development and planning

Broad Tasks	Broad Skill Set	Qualifications	Experience	Providers
Site identification and feasibility	Offshore surveying, measuring aerodynamic and marine conditions, climatic and meteorological assessment Geological & topographic assessment of seabed	Degree / post graduate level specialists into a variety of disciplines	Practical experience and / or research record of working in the coastal / near-shore and offshore zone	Universities Marine research stations
	Short, medium & long term marine biological, environmental & ecological impact assessment and monitoring	Degree / post graduate level marine biology	Practical experience and / or research record of understanding environmental impact in the coastal / nearshore zone	Universities Marine research stations
	Feasibility research into most appropriate power generation device	Degree / post graduate level Aeronautical, marine or offshore engineering		Universities
	Visual impact modelling	Graphic / photographic interpretation & design CAD, GPS	General experience in transforming plans images	Universities Art schools FE colleges
	Engineering surveys for off and onshore installations & grid connections	Degree level engineering CAD	Experience of working in high energy marine environments and with large energy projects	Universities
	Site access, transportation & installation requirements	Civil engineering or construction	Experience of working in high energy marine environments and with large energy projects	Universities
	Financial feasibility Business planning	Accountancy, financial management	Experience of large energy projects, especially developing and applying research models.	Universities

Project planning	Knowledge & understanding of regulatory and legal context	Legal, planning	Offshore oil & gas, tidal, LA & government planning	Universities
	Interpretation of local and national policies	Legal, planning		
	Raising finance	Accountancy, financial management	Experience of large energy projects	Universities
	Permits and consents	Legal, planning	Experience of near / offshore projects, oil & gas sector	
Communications	Consultation with stakeholders	Marketing, promotion, public relations, legal	Experience of communications and public relations in environmentally sensitive areas	Universities
	Consultation with communities			
Project development	Working to time and financial deadlines and limits	Degree / post graduate level engineering	Design and delivery of offshore oil & gas or power projects	Universities
	Development & interpretation of engineering drawings	Marine engineering, Technical Services MA CAD	Design of offshore oil & gas or power projects	Universities FE colleges, private providers Employers
	Procurement and subcontracting	Degree / post graduate level marine & civil engineering Legal & accountancy	Experience offshore oil & gas and power projects	Universities

6.5 Offshore wind: Manufacturing

Broad Tasks	Broad Skill Set	Qualifications	Experience	Providers
Turbine Assembly	Mechanical, electrical engineering, control & instrumentation, general engineering, condition monitoring	Engineering Production MA Engineering Installation & Commissioning MA Technical Services MA Electrical & Electronic Servicing MA Engineering HNC, HND	Engineering Production MA Engineering Installation & Commissioning MA Technical Services MA Electrical & Electronic Servicing MA Engineering HNC, HND	FE colleges, Private providers Employers On the job for product specific manufacturer' courses
Tower manufacture Monopile manufacture	Fabrication, welding, plating	Coded welding, nondestructive test certification Fabrication & Welding MA Welding (Plate) SVQ Welding (Pipework) SVQ	Skilled crafts in heavy fabrication, e.g. oil platform construction, ship building. Apprentices Product-specific	FE colleges, Private providers Employers On the job for product specific
Blade manufacture	Mould and Pattern making Chemical & product control General engineering	Engineering Production MA	Engineering production / assembly: skilled and some semi-skilled. Apprentices Product-specific	FE colleges, Private providers Employers On the job for product specific
Production management	Control of whole manufacturing process: finance, HR, H&S, environmental regulations, quality control, procurement, sales, transport, etc	Engineering degree level, MIMechE or equivalent	Manufacturing management experience, possibly aeronautical	Universities

6.6 Offshore wind: Installation

Broad Tasks	Broad Skill Set	Qualifications	Experience	Providers
Project management	Implementation and delivery of offshore energy project	Degree & professional qualifications	Considerable experience in offshore oil & gas, marine operations and power projects	Universities
	Range of project management skills & knowledge of marine & power sector	Construction engineering, oil & gas engineering, marine operations		Universities
	Management of subcontractors and finance			Universities
Transport & installation of turbine	Overland low loaders	LGV Class One	Experienced operators	Private providers
	Crane operators	CPCS as relevant	Experienced operator, especially in maritime situations	CITB Private providers
	Sea transport – supply boat skills	Relevant maritime tickets Supply Boat MA	Maritime especially aquaculture and oil & gas supply	MCA-registered providers (usually FE Colleges)
	Positioning, mooring & tethering	Degree level marine engineering	Marine operations, aquaculture	Universities Some FE Colleges
	Connecting devices, installation of generator	Degree level marine and electrical engineering	Marine operations, power generation	Universities Employers
	Connecting to transformer	Degree level electrical engineering HV System operations	Power engineering	Universities Private providers Employers
	Sub-sea cable laying	Relevant maritime tickets	Cable laying operations & boat handling	MCA-registered providers (usually FE colleges)
Grid connection	Surveying	Degree level surveying	Civil engineering projects	Universities
	Overland cable laying	Degree level civil engineering Cable jointing	Experienced operators	Universities Private providers
	Excavation	CPCS as required	Experienced operators	CITB Private providers
	Electrical / power installations and connections	Degree level electrical engineering, HV System operations	Experienced power engineers and technicians	Universities FE colleges Private providers

		Electricity & Distribution MA		Employers
Tie Ins, Testing & commissioning	Electrical and commissioning marine / electronic / mechanical engineering Telecoms / controls systems	Degree level engineering Installation & HV systems HV System operations (C&G)	Experience in power distribution / generation and marine operations	Universities Private providers
		Installation & Commissioning MA Electricity & Distribution MA Technical Services MA		FE Colleges Private providers Employers

6.7 Offshore wind: Operation and maintenance

Broad Tasks	Broad Skill Set	Qualifications	Experience	Providers
Operation and maintenance of marine devices	Understanding wind power generation devices	Degree or HND level electrical / mechanical engineering	Experience of maintaining turbines or similar equipment	Universities FE colleges Manufacturer's courses
	Offshore operations and maintenance	Relevant maritime tickets Marine operations	Aquaculture, maritime	FE Colleges
	Maintenance of devices	Degree / post-graduate electrical or mechanical engineering	Hydraulics and turbines	Universities
	Safe Operations – Access / Egress / Rescue	Relevant maritime tickets Marine operations	Aquaculture, offshore, boats generally, towage	FE colleges
	Environmental monitoring	Degree / post-graduate level marine ecology specialists of various disciplines	Marine ecology	Universities
	Revenue control	Accountancy	Experience of renewable energy power schemes	Universities

7.0 Employer Analysis

Just as in a healthy economic system the principles of supply and demand are applied, for an industry to function and grow optimally, it is important to match supply and demand for skills. This section of the report will examine the 'demand' side in the renewables sector – the particular skills and training employers demand.

Employers contributing to this research thought the timing of the study was good, perceiving that the areas of skills development and training were rapidly becoming priorities for their organisations. This has been helpful in encouraging participation and comment from a range of companies and a wide variety of issues were raised. This section provides a detailed analysis of the comments obtained from participants, grouped under key themes. These are:

- Recruitment issues and strategy
- Routes of entry into the sector and associated qualifications
- Training routes
- Employer priorities

Before investigating these comments further, we will first outline the character of the industry in Northern Ireland by identifying some employer characteristics.

7.1 Employer Characteristics

At present, the renewables industry in Northern Ireland is dominated by companies operating in onshore wind energy generation; however wave and tidal organisations are beginning to come to the fore, and the potential business opportunities in these, and in offshore wind, are now recognised. In June of this year the Global Maritime Alliance[30] was launched, on the back of early successes with the Global Wind Alliance, providing a single point of contact to a range of clients looking for a variety of services – all provided by companies operating in Northern Ireland.

Only companies with a role in large scale wind energy generation were interviewed for this research although several companies were also involved in other renewable energy technologies.

In Northern Ireland, as is the case throughout the UK, the remit of these companies tends to fall under one or more of the following:

[30] http://globalmaritimealliance.com/index.asp

- Operations and maintenance
- Construction and installation
- Consultancy and development
- General and component manufacturing
- Research and design
- Support services (infrastructure, grid substation links etc.)

Contributors to this report covered all of these activities.

Business Activity	Employers interviewed
Operations and maintenance	B9 Energy Ltd
Construction and installation	Airtricity (SSE) ESBI Harland & Wolff RES Ltd Siemens
Consultancy, project management and project development	Airtricity B9 Energy Ltd ESBI RES Ltd Siemens
General and component manufacturing	Harland & Wolff
Research and design	Queens University Belfast University of Ulster Institutes of Technology
Support services (infrastructure, grid substations)	Enersol

Currently, wind turbines and blades are not manufactured in Northern Ireland; rather this tends to be dominated by large established companies on mainland Europe. However, Harland & Wolff are increasingly diversifying their role in the renewables industry and it is possible that we will see the manufacture of wind turbines in Northern Ireland in the future. Companies operating in Northern Ireland tend to deliver services either prior to the manufacture of the turbines – site development and planning – and post manufacture – installation, operation and maintenance. To provide the most comprehensive review of skills and training needs in the province it is important to appreciate the wide breadth of careers available within the sector.

7.2 Recruitment Issues and Strategies

Employment vacancies occur when either new positions are created, or as a result of staff moving on or retiring. Successfully recruiting for vacancies can be a problem in a sector where applicants are inexperienced or do not have the necessary portfolio of skills required for the role.

All respondents consulted saw from experience that the industry is attractive to prospective new employees, with most vacancies drawing large numbers of applicants. Few applicants are suitable for the positions however. In one cited example, 60 applications were received for a basic wind technician position, with only eight meeting the essential criteria.

Recruiting from such a small pool of appropriate people produces a sector where employee poaching is common. Salaries become bloated, employee loyalty declines, project continuity suffers and regional competitiveness is negatively affected.

It is unsurprising therefore that employers repeatedly requested assistance to create a larger pool of appropriately skilled and experienced people from which they can recruit. Unless this is addressed there is an expectation of a skills "bottleneck" towards the end of this decade.

"An industry wide response is required...either we need more people with the relevant skills now to prevent a bottleneck come 2020, or the targets for energy generated from large scale wind will simply not be met."

The concern is more pronounced for certain occupations than others. Some roles can be filled by applicants from mechanical and civil engineering disciplines with transferable skills and experience. More specialised positions such as electrical and power engineers, require employers to draw from a very small pool.

Some employers are investing in a range of strategies to influence recruitment. Those encountered included Apprenticeships, Internships and Graduate programmes.

7.2.1 Apprenticeships

EU Skills has been working with RenewableUK (RUK) to develop a Renewable Energy Apprenticeship Programme (REAP). RUK held an Apprenticeship Roundtable meeting in April 2009 where the demand was recognised for the development of an apprenticeship route. This entailed apprentices working alongside experienced staff on-the-job whilst receiving training from a local training provider.

It was anticipated that tailored apprenticeships will be launched in September 2010.

Graduate schemes are likely to be offered by individual companies, tailored to their particular needs and concerns. For example, RES Group have commenced a programme where graduates from a relevant discipline (Marine Ecology, Aeronautical Engineering, Environmental Sciences, Geography, Physics, Sciences, Mathematics, Planning & Development, Finance, Mechanical Engineering) develop the experience needed to make them effective in the role. Graduates on the programme receive a week long induction, and over the course of two years, rotate across three key areas within the company. The graduate scheme is not currently being rolled out in Northern Ireland however.

7.2.2 Sideways recruitment

Another effective approach encountered was to recruit people with appropriate skills and experience 'sideways' from related industries such as Petrochemicals.

Companies using this strategy felt it offered a time-efficient method to source people who will be 'fit-for-purpose' in terms of their transferable skills and experience. Many of the skills required in the offshore wind sector already exist in the offshore oil and gas industry. This may suggest that core training modules for these industries may also be also valid for large scale wind energy generation.

Interestingly, there is also an observable strategy of sideways recruitment from government agencies and businesses involved in land development and planning. Here, people are likely to have not only the transferable skills, but also an understanding of the role, the terminology and also a breadth of useful contacts.

7.2.3 Hard to fill vacancies

In a 2008 study of the Scottish renewables sector, employers indicated an increasing reluctance to recruit specialists in just one area due to high salary costs and increasing competition from other companies and sectors. Many renewable employers are SMEs and cannot afford to hire very narrowly focused specialists. An example cited by one employer was in turbine maintenance where two distinct roles were required – mechanical engineering and electrical engineering. Currently, this was done by two separate individuals but if they could find a technician with both these skills sets they could expand the growth of the organisation many times over.[31]

Experienced applicants often go to the highest bidder, with some companies being priced out of the market. This compounds training issues, as new recruits without the necessary portfolio of skills

[31] Renewable Sector Skills Analysis for Scotland

require more training before they become effective in the role – thereby resulting in a higher cost for the company in terms of course fees, time off the job and time to become effective.

"The problem is not in attracting applicants, it's in attracting suitable applicants with the right skills and experience."

"We are fishing in a small pool; subsequently there is a lot of poaching in this sector."

A number of specific occupations frequently emerged as being particularly difficult to fill:

- Power engineers
- Electrical engineers
- High voltage technicians
- Project managers
- Electrical / power engineers with marine knowledge to work off-shore

Reasons provided for why these vacancies were hard to fill vacancies were:

- Lack of relevant training / qualifications
- Limited uptake of relevant training / courses
- Lack of experience in those with appropriate training / qualifications
- The peripatetic nature of the work
- Expense of training and up-skilling existing workforces

The effects of hard to fill vacancies on the daily operation of a company were given as:

- Increased workloads for current employees
- Preventing work from being undertaken (potentially leading to loss of business)
- Artificially high salaries
- Outsourcing work

Overcoming hard to fill vacancies

As company remits expand and diversify, employee responsibilities are also likely to broaden. For smaller companies especially, new recruits are now more frequently required to engage in the wider project life cycle. Recruitment strategies frequently require applicants therefore to demonstrate not only the correct technical skills, but also their adaptability. Expanding companies reported opportunities for progression into management roles and considered 'softer' skills as desirable attributes in applicants.

"...more attention will be given to general capabilities and competences with a view to recruiting the best, most well-rounded employees."

In a 2008 review of the renewables sector in Scotland, some participant organisations offered a useful tool to increase the pool of experience and provide a broader skill set. They suggested that through networking or alliance partnerships with other agencies, companies could focus more on training and retaining their new and existing staff through a 'crop rotation' method (where employees gain experience of working in different organisations – similar to a secondment).[32]

Larger employers recognise the importance of ensuring they target their recruitment investment now to avoid over-supply of one skill set at the cost of an under-supply in another. An effective long-term recruitment strategy will require careful consideration to ensure that where skills and training are promoted, there will be corresponding jobs.

Yet, few employers consulted had liaised with education and training providers for information on what is required by industry, and thereby improve access to 'fit-for-purpose' applicants. While communication was evident, the extent of investment between industry and tertiary education was insufficient to provide an understanding of what makes a person fit for the role, whether the trainee was new to the employment market or an employee with some transferable experience.

Some employers liaise with secondary education to promote the sector and broaden its appeal, and thereby ensure a supply of interested candidates.

Successfully recruiting a new member of staff is no guarantee that they will stay. In an effort to keep new staff, some employers have introduced mentoring schemes to ensure not only new employees experience a smooth and favourable induction into the company, but also to enable them to quickly become competent and productive in their role, thereby improving job satisfaction.

[32] Renewable Sector Skills Analysis for Scotland

7.2.4 Offshore wind

While the offshore wind sector is currently not as developed in the province as onshore wind energy generation, it was evident that some employers had recognised the offshore potential and were taking a long term approach to position themselves to take advantage of developments within the industry. However, to do so, strategies would have to be supported by an appropriately skilled workforce.

For example, Harland & Wolff currently manufacture "jackets" which secure offshore wind turbines, and are keen to expand further within the sector. For this to be possible, it is important that graduates have an understanding and knowledge of sub-sea conditions such as:

- Meteorological data
- Water depths
- Tides
- Soil readings

These are currently not incorporated into engineering degrees and as such graduates need further detailed training to bring them up to speed. Some of the skills required may be similar to those required in the oil and gas (more traditional) industries, but these are not (and need to be) bespoke to the wind energy sector.

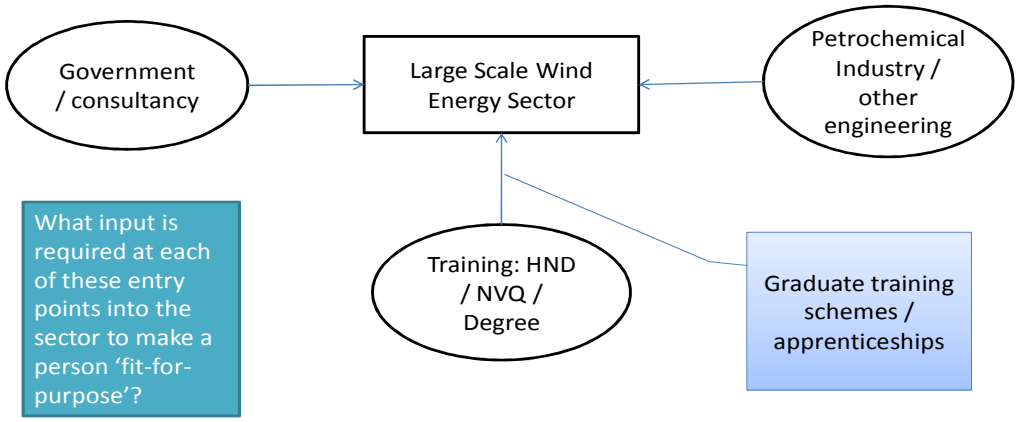
7.3 Routes of entry into the sector

There are many entry routes into the industry. These include:

- Sideways from other applicable sectors
- Sideways from government or a consultancy company
- Directly from college / university courses in
    - Renewables
    - Engineering
    - Marine technology
    - Other disciplines – geology, mathematics
- Graduate training schemes / apprenticeships.

Two main routes of entry have emerged; a sideways movement from a related industry and directly from college or university. In either case it was related by employers that position-specific training is required for any new appointment. It can take from several weeks to several months before they can become effective in the role.

Employers felt that different entry routes were preferable depending on the level of skill or experience required for the position. The sideways entry route was cited as more likely to be successful in sourcing someone with experience and transferable technical or commercial skills.



General entry-level course

Some employers thought a general entry-level qualification for employment into the sector would demonstrate a new applicant's fitness for purpose and also provide the necessary context for the position. This point was echoed by a wind farm manager interviewed for the research who observed that someone with a purely engineering background would benefit from a course providing a general introduction to wind turbines before going on technical / turbine specific courses.

Examining this option further gave rise to more questions than answers however, in that few companies would accept this general qualification alone. What should it encompass? What would be the ideal duration? What should be the minimum skills set to be admitted onto the course? Should it be targeted at college or degree status? Is it possible to sufficiently incorporate the various

disciplines and roles within the sector? In doing so, would this produce graduates fit for the range of positions available?

Given the wide range of roles in the industry, it is unlikely that a one-size-fits-all course could be constructed that met the needs of employers and employees. Employers did suggest however that it might reduce the in-position or on-site training time required to bring the new appointment to a level where they would be useful to the company.

This may seem aspirational; companies such as B9 have very little expectation of sourcing employees who are immediately 'fit-for-purpose' and who would not require significant further training.

The anticipated risks with instituting such a course were that it would be too generic, leaving graduates still requiring considerable further training or secondly that it would be too specific, producing people highly skilled and qualified in a narrow field, but not in other lines of work within the sector.

7.3.1 Qualifications cannot be viewed without experience

The research encountered a lack of consensus currently over what qualifications are desirable to enter the industry. Employers disagreed whether a degree is a necessary requirement or not, and whether a general engineering, construction or mechanical qualification is sufficient, or if should be combined with a wind energy / renewables focus. This view was held not only by employers, but also by employees, for example the wind farm manager who considers that the real recruitment challenge will come in sourcing people with relevant experience;

"...degrees are not as important as experience, which really is everything."

Employers also found it challenging to specify the relevant qualifications required for a specific role. Companies had different tasks and requirements from individuals with similar job titles – e.g. project management and qualifications were judged in relation to the experience gained in their use.

In identifying the ideal qualifications, an interesting point to consider is that there are existing courses and qualifications with valuable components, which may in combination, provide the best grounding for potential employees. For example, an employee working in the industry for 11 years suggested that the best engineering course would be a joint one combining mechanical and electrical engineering, as opposed to one or the other.

7.3.2 Consensus around Health and Safety only

It is anticipated that as the sector matures, specific qualifications will be demanded by the industry. Indeed, one employer commented that their clients stipulated particular training and accreditations to be permitted to work on their sites.

It is then unsurprising that one area of consensus is on the necessity of comprehensive and up to date set of Health and Safety certifications. Aside from the essential Health and Safety aspects, this "Wind Farm Passport" would provide several benefits including training procurement efficiencies, scheduling off-site training and client reassurance. Some companies interviewed mentioned that Health and Safety training demanded on occasions up to 90% of their organisation's training budget.

7.3.3 Fit-for-purpose versus fit-for-position

The entry route of an individual into the industry may determine their subsequent progression within the individual company and indeed the sector as a whole. However, several comments highlighted how some new appointments were "promotion-hungry" and wished to progress rapidly to higher levels in the sector. This caused medium-term problems as the individuals are needed to fill the position for which they were originally recruited. Some employers labelled this as the difference between fit-for-purpose skills and training and fit-for-position aptitude.

Again, this varied between the different employers depending on their size and sphere of activity. An Operations and Maintenance company, such as B9, is keen to recruit engineers who will be engineers, while companies such as Airtricity and RES Group which are involved in the broader life cycle of projects are keen to recruit people with the drive and capacity to progress in both the technical and commercial aspects of the company.

Some employers relayed an acceptance of competence in a set of transferable skills (an example given was a car mechanic) who can then undergo on-the-job training in the sector and job specifics. Others prefer to recruit individuals who already have training or experience directly related to the sector, and therefore require less on-the-job training.

7.4 Training Routes

A key aspect of this research was to draw out an employer perspective on the accessibility and appropriateness of training for the sector. Two main themes emerged: training for competence and training for progression. However again, it was difficult to obtain any degree of convergence on a particular type or level of course with different employers expressing different preferences. The ideal training depended upon the skills and qualifications that the employer valued, on the specific position to be filled and on the prior training, skills, qualifications or experience already held.

Because the wind energy industry is relatively new, to date employers have tended to recruit directly from education or from engineering industries. For certain positions the predominant consensus was that training in engineering was the preliminary requirement for employment. However, regardless of the skills and experience brought to the new position, the new appointee would require a range of environmental adaptations. These included health and safety training, high voltage training, safety at sea, and training in working at height. A useful point was that any of these specific training courses, even for people with degrees in mechanical or electrical engineering will be much more valuable if the people on the course already have at least a basic understanding and knowledge of wind turbines, gained perhaps through a short general turbine course.

The diversity of the industry makes it difficult to produce a single, comprehensive training path. A typical training route (as outlined by B9) for a competent operations and maintenance technician is likely to chart the following path:

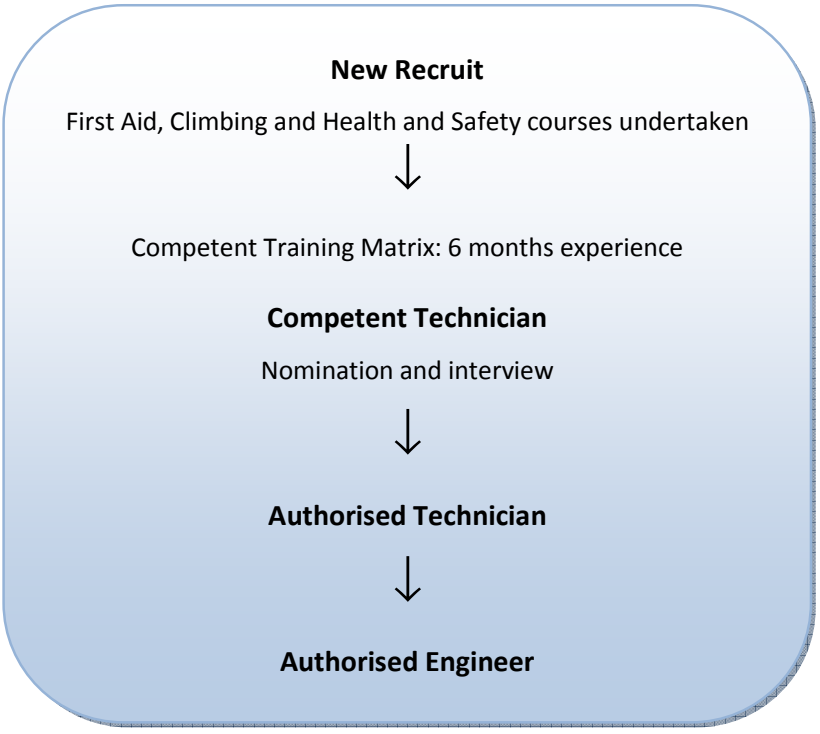
- HnD or equivalent in engineering / technology / manufacturing (pre-employment)
- Health and Safety training (upon employment)
- Site / turbine specific training (post-employment)
- Height training (post-employment)

Where convergence exists over training needs amongst different companies, it is likely that these training needs can be met through pre-employment training at Further or Higher Education level. Conversely, where employers require specialised training, this will likely be accessed through private training providers, or on-the-job training. In the case of an operation & maintenance engineer, once employed, it can take an individual 6 months to become familiar with the turbines, policies and procedures and to have undertaken all relevant health and safety courses and thus be competent in their role.

7.4.1 Training plans

While not all of the employers who contributed to this research had a structured training plan and related budget set aside, all were clear that training new employees and up-skilling existing employees were considered integral to business strategy and growth.

A typical training matrix for wind turbine technicians in B9 Energy Ltd is outlined below. All competent and authorised technicians must have completed the Competent Technician training outlined in the matrix below. As soon as an employee is taken on they must complete First Aid at Work and NARC Climbing courses, along with various other health and safety courses. A new employee is only considered competent (becoming a Competent Technician) after 6 months of employment and once this training has been fully completed. This time is spent shadowing the Authorised Technicians as they go about their work on the turbines. They are coached and mentored by an authorised technician until they are experienced enough to become an authorised technician themselves. To become an authorised technician you must be nominated and interviewed. After Authorised Technician, the next step is Authorised Engineer.



Up to 90% of a company's training budget in this sector is likely to be devoted to health and safety training. This training is accessed internally and externally at considerable cost, and requires time off the job which can be a logistical challenge.

7.4.2 B9 Training Matrix

Engineering Training Competent Technician - External Training	Cost
Induction to B9 Energy O&M Ltd	
Aerial Riggers Medical	
WTG Climbing Course	
First Aid at Work	
Risk Assessment	
COSHH	
Manual Handling	
Basic Fire Fighting	
Spill Kit & Environmental Awareness	
Inspection of PPE - Competent Person	
Health & Safety Card Test Touch Screen	
Slinger/signaller	
Appointed Persons - LOLER (Lifting Operations & Lifting Equipment Regulations)	
Abrasive Wheels	
Defensive Driving	
Asset Management	
Bonus Energy A/S Brande, Denmark:- Intro to 1.3 mw combistall	
G52 Competency	
Vestas Training	
High Torque Training (CITB)	
Mounting/Dismounting of SKF Coupling	
E&M Safety Rules	
Wind Turbine Safety Rules	
HNC Engineering / NVQ Engineering Level III	
The National Examination Board in Occupational Safety and Health (NEBOSH)	
Client / Contractor National Safety Group Safety Passport	
HV / LV	
High Voltage Systems Operations	
Advanced Operator Course	
Electrical Safety Course	
Portable Appliance Testing	
Site Supervisors	
IOSH Managing Safely	
Management Training	
Lifting Supervisor's Training Course	
Internal	
Working with LV Electricity	1 x Internal
Bonus 450 / 500 / 650 Competency	10 x internal
WD 34 Competency	10 x internal
Vestas Training	Internal
IT - Outlook / Word / Excel	Internal

7.4.3 Work / training balance

Employers are keen to get the right balance between reaping the benefits of a fully and comprehensively trained workforce, and losing employee working hours through off the job training. For example, a typical wind farm manager in Northern Ireland is likely to be on off-site training at least one day for every two months, averaging approximately 8 – 12 days per annum.[33] Per employee, this is a not insignificant figure. It is crucial therefore that employers can rely on access to training that is worthwhile and fit-for-purpose, and is delivered efficiently and effectively.

7.4.4 Potential barriers to training

Employers cited a number of difficulties in accessing training both for new recruits and for up-skilling their existing workforce.

Primarily, they were concerned about the loss of work time resulting from attendance at training courses. A key consideration in the decision is the efficacy of the training available and the resulting time and cost savings associated with a more highly skilled workforce.

Some employers are not aware of the range of courses available, or feel that there are not suitable training programmes on offer.

It is important to consider the location of training; with employers keen to maximise their employees working time and find cost efficiencies, they are keen to access training as conveniently as possible. It is recognised that good quality training located some distance away (such as that which some employers are accessing in Denmark) is more important than lesser quality training closer to home.

The overall cost of training courses is therefore also an important factor. As some training, particularly in operations and maintenance, is based on mainland Europe, training costs must include travel and accommodation making the overall expense substantial.

[33] Interview with Michael Mitchell, Wind farm manager, B9 Energy Ltd

7.4.5 Does existing training match industry's needs?

Employers recognise that some training can only be done post-employment. There is some convergence over specific training elements which, if incorporated into existing programmes, could produce a streamlined route, outputting individuals with the skills, qualifications and experience.

In this way, once employed, new recruits would require only limited further training and consequently would be considered 'fit-for-position' more quickly. These elements are likely to include the following:

- Comprehensive health and safety training
- Training at height
- High voltage training
- For offshore; safety at sea and working in marine environments.

An aspect which employers currently see as lacking in most existing training routes is experience based modules, where experience in the practical application of training compliments the theoretical features of the training.

In putting together a training route that incorporates experience with technical training, several employers (RES Group, Airtricity) involved in the study raised the possibility of apprenticeships and graduate placement schemes as providing a more comprehensive path into the industry.

Graduate placements are currently being rolled out in the UK, but are not yet available in Northern Ireland. The RES Group scheme is based in Kings Langley and introduces graduates to various aspects of the company to gain essential on-the-job experience in technical, business, negotiation and communication skills, producing an employee with a broad portfolio of competence.

EU Skills have produced the **National Occupational Standards for Power**, and are developing apprenticeship programmes and recommendations in association with the RenewableUK.

Challenges identified when it comes to sourcing and supplying the training required to bring a new recruit up to speed and leave them fit-for-purpose are several and not altogether straightforward to overcome. These include:

- Provision of facilities (e.g. for training at height, or at high voltage)
- Funding of courses and facilities

- ‘Training the Trainer’; South West College reported difficulties in sourcing a suitably qualified candidate to fill the post of lecturer in wind.
- Getting the right balance of technical / experience based / professional modules.
- Tailoring the training to the requirements of both on and offshore.

Analysing training routes cannot be limited to new employees; a consideration of training options is also very relevant to employers keen to up-skill their current workforce, and ensure that the people they employ are operating at maximum efficiency and effectiveness. This is crucial both in the face of new and emergent technologies, and also in the event that companies broaden their scope, for example extending from onshore into offshore generation.

8.0 Employer Priorities

Wind energy organisations operating in Northern Ireland believe there are two areas of growth in the sector. The ongoing and steady "solid growth" of onshore which is directly relevant to the Province, and the impending "dynamic growth" of the offshore, which may appear to have less direct relevance to some Northern Ireland operators at this stage. Those organisations operating in onshore projects felt they were "just maintaining" operations in a period of steady growth. Offshore was not seen as a short term priority and little training or development activity had been undertaken.

This lack of early action in a relatively youthful and rapidly expanding field prompted some respondents to say that that Northern Ireland has a "risk averse" mentality.

Depending on the company and their role within the industry, perspectives ranged from those who were concerned about the emergence in the near future of a skills crisis, to those who, while concerned to develop the most effectively skilled and appropriately trained workforce, did not foresee any particular difficulties or barriers to this development.

Amongst those who perceived an impending crisis, an emerging theme seems to be a desire to adopt long term skills development and perhaps more importantly **experience development** strategies to deal with anticipated growth, reducing the likelihood of a 'crisis management' scenario becoming necessary.

Several common priorities were evident however. These included:

- Experience and transferable skills
- The need for industry/education collaboration
- Long term skills planning - STEM
- The need for a global outlook

8.1.1 Experience and transferable skills: 'Smart' mix

The need for qualifications and experience was frequently cited as a priority. Understanding the sector growth, employers were keen to source people with the ability to "hit the ground running". The priority is to recruit individuals who not only have the necessary knowledge and technical awareness, but also an understanding of how to apply this knowledge, and put theory into practice.

Employers told of several solutions they had implemented, or were considering, to alleviate the issue. These ranged from graduate placement schemes through to apprenticeships and internships.

It is evident that employers also place a great deal of importance on commercial skills. Respondents thought it very difficult to locate individuals with technical expertise, who also possessed business acumen. Project management, negotiation and communication were occasionally prioritised above wind energy / renewables qualifications. There is a need for people who can understand and be involved in the whole life cycle of projects.

"The ideal person will blend these skills together, for example combining technical training with interpersonal and business experience as a successful project manager".

Participants discussed how it was important to attract people from sectors affiliated to the wind energy industry such as government planning agencies and land agents. These individuals have key transferable skills and contacts and an awareness of issues facing the sector from a different perspective.

8.1.2 Smart Economy

Participants related their interest in the "Smart Economy" aspiration promoted by the Irish government and media. According to the Department of the Taoiseach, a smart economy

"combines the successful elements of the enterprise economy and the innovation or 'ideas' economy, while promoting a high-quality environment, improving energy security and promoting social cohesion ."[34]

As such, the smart economy is intended to bring together diverse but complementary components of the broader financial system so as to achieve its maximum potential and efficacy. Employers felt

[34] http://www.taoiseach.gov.ie/eng/Building_Ireland's_Smart_Economy/

this could be a useful model through which to view the diverse but complementary range of skills, and could develop in their ideal employee. In combining 'hard' or technical skills with 'soft' inter-personal and business skills, the result would be '**smart skills**'.

As opposed to a 'workforce of all the talents' (echoing Gordon Brown's aim for a 'government of all the talents'), which would bring together employees each with a very specific skills set and remit, employers are keen to develop an 'employee of all the talents', with each individual employee displaying a wide range and breadth of transferable and specific skills.

8.1.3 Collaboration: 'Joined up thinking'

A further relevant priority for employers was the need to improve collaboration in the renewables sector within industry and also with training and educative bodies. Employers felt a joined-up and unified approach to government legislation and directives is likely to achieve more success than lone voices from within the industry. Irish based respondents in particular thought there were too many industry bodies with different disciplines and this did not help with formulating a collated voice. A range of organisations were mentioned by employers as the first point of contact for training and development issues.

From a training and skills development perspective, companies feel it is in their interests to work together and consult with training providers to devise the most effective solutions. There have already been significant steps taken towards achieving this goal.

- Officially founded in May 2009, the Global Wind Alliance brings together companies operating within the wind industry from Operations and Maintenance (such as B9) through to the design and maintenance of grid substations (Enersol) and education/training (South West College), under one global alliance.

- Within the last 18 months, initially born out of a need to present a unified response to legislation such as PPS-18, a Northern Ireland RenewableUK / IWEA working strategy group has been established (most companies operating within Northern Ireland have dual membership of the two bodies). While originally conceptualised as an ad hoc group providing an industry response to immediate sectoral developments, the group experienced an increasing realisation of an on-going and longer term need for co-ordinated engagement and action.

8.1.4 Long term skills development: STEM

Some companies indicated their concerns about longer term recruitment issues and predicting the number of people required.

One interviewee referred to what he saw as a potential "bottleneck" arising towards 2020 as the industry finds it difficult to meet targets or stalls due to a lack of necessary human resources.

While the current trend amongst these companies is very much to recruit for vacancies as they open up, there was also an aspiration to put in place longer term strategies for skills development, to ensure that there will be a sufficient pool of appropriately trained and skilled people to meet growth.

Therefore an industry priority is to promote the STEM subjects (Science, Technology, Engineering and Mathematics) in schools and therefore improve the uptake of relevant courses at college or university. A current example of practices adopted in line with this priority would be RES Group which sends engineers out to schools to chat with young people about the company, and the industry as a whole.

At a further and higher education level, companies are keen to influence the courses on offer – placing more emphasis on the practical elements in more academic courses and ideally the incorporation of work placements or apprenticeships to provide potential future recruits with the hands-on experience now deemed preferable.

8.1.5 Northern Ireland as a hot-house for skills export

A final emergent theme was the broader, global outlook clearly shaping the priorities driving some companies, and comparing this with the more localised outlook structuring those of others, particularly in this industry.

There are two main themes; that Northern Ireland would be ideally placed as an exporter of skills, and that training therefore should not be focused purely on skilling a Northern Irish workforce for the Northern Irish market. While this is obviously key, a global perspective – such as that taken by the GWA referring to Northern Ireland as a potential skills "hot-house" - would be to train the local workforce for the global market, to enable them to take advantage of opportunities across the wide spectrum of careers in the wind energy sector, across the globe.

The second, more localised approach is to limit (and ideally, eradicate) the need to import skilled workers into Northern Ireland, as a result of not being able to find the right people locally. One company provided examples of recruiting from England and Scotland to commute to Northern

Ireland for the working week; the appropriate person was simply not to be found within the province.

The issues here are the drive to eliminate inefficiency, the motivation to skill the Northern Ireland workforce, and finally the goal for companies operating in Northern Ireland, or the wind farm owners, to not have to rely on the often more expensive services of the manufacturing companies or larger international organisations for maintenance, repairs and parts etc.

It is important to note that these approaches are not mutually exclusive, and that the various companies we spoke to combined elements of each in their thinking and strategies.

8.2 Case Study: Wind Farm Manager

In investigating and analysing the skills and training required by employers within the sector, it is important to keep in mind the 'human element' behind the data. Employers were able to identify different training matrices and / or typical promotion paths for employees. We were keen to profile an employee to gain an insight from an 'on-the-ground' level, as opposed to a 'top-down' viewpoint, into:

- Recruitment
- Routes of entry into the sector
- Qualifications
- Training issues
- Day to day activities

Michael Mitchell is a site manager employed by B9 Energy. He has worked for B9 for almost 11 years (since the age of 17), having started following a work placement, working his way up from Competent Technician through to Authorised Technician, and then Authorised Engineer and site manager. Michael took a course in electrical engineering at the Larne Technical College, through which he got a placement in B9. In the second year of the course, Michael was employed by B9, so by the third and final year of the course he was working at B9 four days a week and on day release one day to the technical college. Three of the four days were spent in the office undertaking administrative jobs, while one day was spent shadowing engineers and technicians on-site. Michael is now responsible for four sites across the province in Limavady, Cloughmills and Ballymena. Michael now spends approximately half his time on-site and half in the office dealing with paperwork and management tasks.

Michael studied electrical engineering, and with hindsight from 11 years working in the industry, he believes that the best course would be a joint mechanical and electrical engineering course (though he also noted that he was able to pick up the mechanical engineering skills he needed through experience).

Michael believes that where problems will be faced will not be in getting people with the qualifications B9 require, but with the experience needed. Michael considers experience to be a priority. Michael would, on average, be out on training at least one day for every two months – mostly relating to health and safety. One area of training that Michael suggested would be helpful is for new staff to being able to identify and extract the relevant material from a diverse range of training manuals, each with their own unique structure and approach. . When a new piece of equipment comes in, or a new turbine, it can be a challenge and take a while to get used to the individual manual. When a new site is taken on, the turbine manufacturer has to provide a training course on the turbine. Michael considers that any training courses, even for people with degrees in mechanical or electrical engineering, will be much more valuable if the people on the course already have at least a basic understanding and knowledge of wind turbines. He advocates a general turbine course at college, even for a week. Coupled with experience, this would be great for new recruits to have.

Meeting with an employee working on wind farms in Northern Ireland brought a very valuable perspective to the research, whether in confirming information provided by employers, providing a valuable context for points made, and in adding further insights.

8.3 Emergent Points

This section draws together the key emerging themes highlighted by employers. The context in which these comments were provided is important. Operators in the large scale wind energy sector feel that Northern Ireland has the capability to be at the forefront of developments within the broader renewables sector, and in wind energy generation in particular. Several thought the Province could be a potential 'hot-house' for skills within the sector, which will not only support and facilitate the growth strategies of companies here, but may also lead to skills exporting. The ambition exists to position Northern Ireland as a world leader; the mechanisms and facilities must be in place for it to be encouraged and realised.

The key themes identified can be summarised under four headings:

- Recruitment issues and strategies
- Routes of entry into the sector and associated qualifications
- Training issues
- Employer priorities

8.3.1 Recruitment issues and strategies

Recruitment proved to be a concern to employers to varying degrees and across diverse positions and occupations. At this stage, employers thought that recruitment strategies should be durable and needed to take a long term perspective. Poaching staff from other companies within the sector is not sustainable and prohibits a cost-competitive culture. Instead, employers are keen to support the building of strong foundations to funnel appropriately skilled, qualified and experienced people into the sector through internships, mentoring, apprenticeships, graduate programmes and school outreach schemes. A small pool of these people currently available – unless expanded and developed is likely to produce consequences which will adversely affect the industry, including salaries being set artificially and unsustainably high, and potential skills "bottleneck" towards the end of the decade.

8.3.2 Routes of entry

Two main routes into the sector emerged; firstly sideways from industries such as petro-chemicals and secondly, directly from further or higher education. There are positive and negative aspects to each path. Where people are recruited from other, similar industries, they bring with them developed skills sets and often relevant experience identified as a priority for employers. The decline of the more traditional oil and gas industries and the concurrent expanding appeal of the renewables sector are perhaps likely to make the sideways path an attractive one. However, this is not sustainable in the long term and recruits who follow this path will still require further training.

Where relevant further or higher education courses exist, producing graduates with a directly applicable qualification, employers benefit from recruiting someone with the necessary technical understanding and not in need of the depth re-training required by someone without such a qualification. However, fresh recruits lack the on the job experience prioritised by employers.

8.3.3 Training issues

The ideal candidate can demonstrate the strengths in qualifications and experience. The obvious emergent theme therefore was the need for training courses to incorporate experience based modules, in which practical application compliments the theoretical features of the training.

There are no current plans for the development of offshore wind generation capabilities here. However the peripatetic nature of the sector means that this should not preclude the promotion of offshore skills in the workforce.

As the sector grows, employers are looking to technically competent staff to undertake more business management roles, yet have found these soft skills - communication, negotiation and management frequently need developed. General business management training courses are already well catered for, however several employers thought more courses, specifically relevant to their industry would be more cost and time effective and result in a better combination of hard and soft skills to produce a 'smart' mix.

8.3.4 Employer Priorities

There was some convergence over a number of priorities for recruitment and training both for individual companies and for the sector as a whole. In particular, certain key positions – electrical and power engineers and project managers - prove particularly difficult to fill, principally due to applicants lacking in skills or experience deemed essential by employers. A priority therefore is to

work towards there being a sufficient pool from which to recruit for these positions and thereby avoiding the anticipated skills “bottleneck”.

In order to realise training and recruitment aspirations, employers have identified a need for collaboration between industry and education to achieve courses tailored to meet industry needs. This collaboration should extend not just to further and higher education, but also into schools through the promotion and encouraged uptake of STEM subjects, ensuring that there is a sufficient supply chain of young people moving into the industry.

Employers expressed a keen interest in the establishment of industry-wide standards against which job applicants and existing employees can be assessed, and to guide the provision of training. In discussion with EU Skills and RenewableUK it emerged that these standards will likely be met by the National Occupational Standards for power.

The NOS combine:

- Technical skills – from electrical and functional testing of fitting plants through to removing and replacing gearboxes and drives.
- Soft skills – from leading the work of teams and individuals to organising the use of resources.
- Experience – demonstration and completion of skill based units.

Further information can be accessed on the EU Skills website:
http://www.euskills.co.uk/home/resources/search/folder/147/title/Electricity+Power+Utilities+NOS/

8.4 Conclusions: employer analysis

Employers have recognised that without intervention, there is a very real and strong possibility of a serious skills crisis in the coming years, one that could lead to a "bottleneck" in the industry, hampering growth and innovation. They are aware that the solution to the problem is two-fold: first, the industry has to market itself to potential recruits both from existing traditional industries and from schools and further education institutes; and secondly, employers have to engage with education and training providers so as to ensure that courses developed are in line with the skills needed. In essence, employers need to advertise their demands in order for there to be a responding supply.

8.4.1 Onshore currently a higher priority

The onshore division being a more mature market has a better understanding of the skills and experience required to meet the challenging 2020 targets. Offshore potential is relevant to some operators in Northern Ireland but recruitment and training activities are not yet on the agenda. This is viewed as disappointing by some, who feel the province has an excellent opportunity to become a skills exporter in wind generation.

8.4.2 A new sector must utilise existing courses and experience

Two main routes of entry have emerged into the sector; a sideways movement from related industries and secondly directly from college or university. Few people have the desired skills, fewer still have the necessary experience, and recruitment can be difficult. Individuals with an effective mix of technical competence and business management experience are elusive.

Most respondents highlighted the growing demand for electrical and power engineers and their increasing concern at the dwindling supply. Several requested prompt action at stages along the supply chain to make these disciplines more accessible as a career choice.

There is a real potential – which is being recognised – in harnessing the skills from the existing petrochemical industry and to make small adjustments to existing training.

8.4.3 Lack of consensus over ideal entry qualifications

The research encountered a lack of consensus currently over what qualifications are desirable to enter the industry. Employers disagreed on whether a degree is a necessary requirement, and whether a general engineering, construction or mechanical qualification is sufficient. Employers found it challenging to specify the relevant qualifications required for a specific role as experience in the use of the qualification was deemed a crucial factor. It is anticipated that as the sector matures, more specific qualifications will be demanded by the industry.

8.4.4 General entry qualification has a limited use

The idea for a general entry-level course was rooted in a perception among employers that current courses were fragmented and incomprehensive. Some thought a general entry-level qualification for employment into the sector would demonstrate the applicant's fitness for purpose. While few would accept this general qualification alone, some employers thought it might reduce the in-position training time required to bring the new appointment to an acceptable level of competence.

8.4.5 Consensus around Health and Safety only

One area of consensus is on the necessity of comprehensive and up to date set of Health and Safety certifications. Several participants mooted the idea of a wind-farm passport, showing a full and up to date set of the certificates necessary to be safe on site.

8.4.6 Training for competence versus training for progression

Two main themes emerged: training for competence and training for progression. Several comments highlighted how some new appointments were "promotion-hungry" and wished to progress rapidly to higher levels in the sector. This caused medium-term problems as they were needed to fill the position for which they were originally recruited.

8.4.7 Pre-employment training relevant to most off-the job aspects

Where convergence exists over training needs amongst different companies, it is likely that these training needs can be met through pre-employment training at Further or Higher Education level. Conversely, where employers require specialised training, this will likely be accessed through private training providers, or on-the-job training.

8.4.8 Qualifications cannot be viewed without experience

Employers felt courses must contain adequate opportunities to develop on-site experience. Some have already invested in apprenticeships and graduate placement programmes. This is an employer priority.

8.4.9 Joined up working required

Participants saw the emerging need to work closely with education to develop effective courses and transition into the sector, however still recognised the difficulties of investing time and also of foreseeing the disciplines required to meet future demand.

8.4.10 Simplification and coherence

Employers agreed that there is no single or coherent source for information on the training needed and courses available; they were keen to see a more simplified and streamlined training landscape.

8.4.11 A new course?

From our discussions with employers, it is evident that there is an appetite for a new training course, delivered in Northern Ireland, and particularly designed for wind turbine operation and maintenance technicians. While manufacturers deliver turbine specific training (often in European countries), this is costly and is putting a financial strain on companies. When viewed alongside hard to fill vacancies, which result in rising salaries, the economic burden of expensive and time consuming training on what are often small to medium sized enterprises is not sustainable.

9.0 Education and Training Provider Analysis

This section of the report is intended to provide an overview of training available and an assessment of perceived gaps in provision.

An emergent theme from the employer analysis was that Northern Ireland has the potential to take a lead role in developments within the broader renewables sector and in wind energy generation in particular. However, for this to be realised, a supply chain of suitably qualified and skilled people must be encouraged. There was some divergence over what 'suitable' qualifications and skills would be, and as such it is important to have a range of courses on offer which will meet the needs of both students and their potential employers.

To date, employers felt information has been fragmented. This chapter will provide an overview of education and training courses and facilities within Northern Ireland, and an insight into the educationalist perspective as to the suitability of provision, priorities for the future, and potential challenges. As with our discussions with employers, education and training providers were interested in the research, saw it as a timely piece of work and were keen to give their input, analysis of which is grouped under key themes.

- Regional context
- Course catchment: who is accessing education and training in this sector
- Education provision
    - What is available
    - Key themes
    - Challenges to provision
- Employer requirements: collaboration and input

9.1 Northern Ireland context

Employers in the renewables sector within Northern Ireland are keen to see the province at the forefront of developments within the industry. Their goal is for Northern Ireland to be a 'hot-house' for skills, supporting and facilitating the growth strategies of companies here, encouraging investment, and potentially exporting services. Their ambition is to position Northern Ireland as a

world leader in the renewables sector, and particularly large scale wind energy generation. For this to be realised however, the consensus was that appropriate mechanisms and facilities must be in place.

This very much dovetails with the views of education and training providers in the province. There is considerable optimism amongst education and training providers as to the potential here, to gain a worldwide reputation in the sector, training the local workforce for the global market, enabling them to take advantage of opportunities across the wide spectrum of careers in the wind energy sector.

This emerged through discussion with a number of education providers. For example, a central objective of the Carbon Zero NI Project (led by the South West College) is to position the Northern Ireland Further Education sector as an engine for, and subsequent market leader in, the development of smart, innovative and sustainable technologies, to include wind energy, energy from waste and clean energy storage. At both Dundalk and Letterkenny Institutes of Technology, the view was that rather than considering simply the local jobs market, they are keen to educate students for the world market, and attract students from across the globe. Letterkenny Institute of Technology have had enquiries from a range of non-European countries expressing interest in their courses for wind turbine technicians, while South West College (through the Carbon Zero NI Project) are cultivating links with industry in the USA. Perhaps indicative of this holistic and broad view is the membership of several training providers in the Global Wind Alliance.

As such, the context is a complex and multi-faceted one. Institutions here are not only educating the Northern Ireland workforce for the Northern Ireland jobs market, but given the nature of the sector, are also educating individuals for the global jobs market. In particular, given their proximity, there are strong links with the Republic of Ireland, and across the UK. There is a cross-border flow as individuals from outside Northern Ireland access education or training within the province and, conversely, as people from Northern Ireland access courses and facilities further afield. For this reason, it was important to include in the pool of education and training providers involved in this research, representatives from the Republic of Ireland and the UK.

- Students from here going to the UK / Republic of Ireland
- Students from there coming here: UU, people coming across from Donegal for example.

The assessment of education provision will need to consider the adaptability of courses and responsiveness of providers, given the rapid pace of change in the industry.

9.1.1 Carbon Zero NI

The Carbon Zero project is an initiative aimed at supporting skills development and job creation within the renewable energy sector within the province. It is led by the South West College, and brings together all six Further Education Colleges, as well as industry representatives from NIE, Bombardier and B9 Energy. It is funded by the Department of Employment and Learning.

Course literature states "The Carbon Zero NI Training Programme will offer courses that will address the ever increasing need for skills and knowledge in the area of clean energy development in Northern Ireland."35

The Carbon Zero NI objectives are:

- To position the NI Further Education sector as an engine for, and subsequent market leader in, the development of smart, innovative sustainable technologies in the areas of clean energy to include Wind energy, Energy from waste and Clean energy storage
- To identify international market opportunities in the areas of sustainable development and clean energy and assist NI companies to exploit these opportunities through skills development and the provision of appropriate courses to up-skill the Northern Ireland workforce. This will be facilitated via the establishment of a "Knowledge and Technology Platform" in the area of clean energy.
- To develop a model of high impact 'clean and green' regional capacity building and business development programmes throughout the Northern Ireland Further and Higher Education sector.

One Carbon Zero NI course offered through the South West College is a course in 'Wind Turbine Technology', designed to provide students with the skills they need to analyse sites for their suitability for wind turbines, calculate accurately how economically viable a site may be, and give a broad understanding of the different turbines and wind farm systems. This course is currently only offered through the South West College. According to Programme Director Tom Mayers,

"It's widely recognised that future economic growth lies in the development of sustainable, clean technologies that benefit the environment and support job creation. Carbon Zero NI allows FE colleges to take the lead in helping to equip students and businesses with the expertise and skills to profit from the green economy."[36]

[35] Carbon Zero NI Training Programme
[36] http://www.4ni.co.uk/northern_ireland_news.asp?id=109124

9.2 Accessing Education and Training

Several distinct groups of individuals who would access education and training in this sector can be identified. These groups can be differentiated by their different requirements and attitudes towards (re-)education. We have categorised four main groups.

- School leavers
- Undergraduates
- Professionals
- Skilled / unskilled workers

It is important for both education providers and industry to be aware of these different groups, as this may determine the need for certain courses or the appeal of certain career paths. People come to training with different skills sets ranging from school leavers to experienced engineers or managers, and courses need to take cognisance of this prior learning – or lack of it. For example, some courses may require applicants to already have an understanding of and experience in working in electrical engineering, providing only an 'add-on' understanding of how to apply these skills to working on large scale wind turbines, such as conventional engineers who wish to move 'sideways' into the renewables sector. Conversely, other courses are aimed at individuals who have no knowledge of the skills required to work in the sector, such as school leavers.

From a career-path perspective, individuals who are keen to pursue a technical career in the industry may have different educational preferences to someone interested in the commercial aspects.

Each group is dynamic, and the requirements of each or the size of the group may change over time. There is currently some concern over declining numbers of school leavers pursuing a career in this and other related fields. Efforts are being considered to increase the uptake of STEM subjects (Science, Technology, Engineering and Mathematics) in schools, which may lead to an increased number of school leavers pursuing courses in large scale wind energy generation. Similarly, with the decline of industries such as petrochemical engineering, it is likely that we will see more 'sideways' movement into the sector, as people with transferable skills pursue a change into renewables.

As such, there is a wide portfolio of courses available catering to each of these groups. However, several key points must be considered:

- Are each of these courses fit for purpose?

- Do they provide course graduates with the skills employers require?
- Could they be compacted into one, fit-for-purpose and all-encompassing course?

Education and training providers are in the position of needing to reconcile what the industry wants with the demands of students, and the need to market their courses attractively. Providers will find themselves unable to offer courses which do not prove popular with school leavers or those looking to move 'sideways', up-skill or retrain. University College Dublin currently offers an electrical power degree[37], which may be closed due to not getting enough applicants. Similarly, the number of electrical engineers graduating from QUB this year will be approximately 40; less than half of the annual average number just five years ago (90).

The challenge is compounded when seen beside the increasing demand for graduates of such courses. A clear priority emerges for education and training providers in how to reconcile the requirements of industry with what attracts the applicants. One element which many potential students consider when selecting a course is their subsequent employability. Where prospective students do not select courses that industry and employers clearly value, the issue may be in a lack of awareness or promotion of the career prospects opened by completion of these programmes.[38]

9.2.1 Long term strategies to attract school leavers: STEM Project

A key strategy currently being promoted by several employers who contributed to the Report is to create links between education and industry, not just at the level of further and higher education but also in schools, and encouraging the uptake of STEM subjects. Therefore an industry priority is to promote the STEM subjects in schools and improve the uptake of relevant follow-on courses.

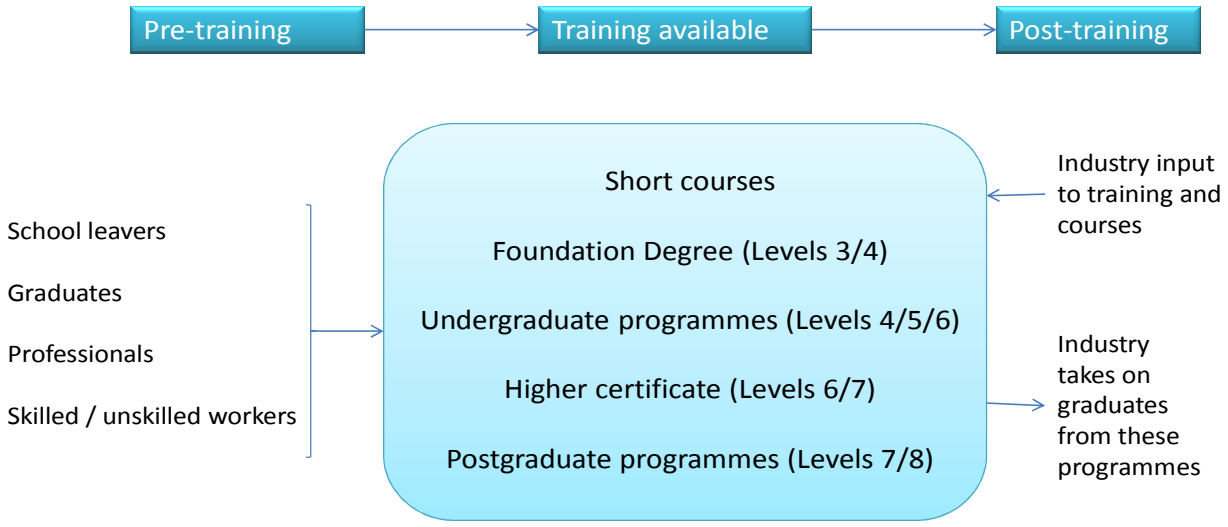
Andrew Brown, Global Training Director with GL Garrad Hassan noted his concern that fewer young people are choosing to study the 'hard' subjects. He suggested that effort needs to be made at a school level in order that the supply of potential employees does not continue to reduce as the demand for them increases. Several education providers emphasised the importance of careers advice, and the need to support young people into the sector. School leavers are often not aware of the courses they can or need to do to get involved in the renewables sector, despite several initiatives to speak to head teachers and careers advisers.

[37] DIT meeting
[38] QUB meeting

9.3 Current education and training provision

Currently there is not a comprehensive and maintained resource detailing the courses available.

For the purposes of this research, we have made an effort to collate those courses available at the time. The courses currently available cater to different groups, with some directed at recent school leavers, and others more suited to people who have considerable experience in the field already.



9.3.1 List of Relevant Courses

This list is not exhaustive, however it provides a useful overview of the courses and training programmes available both in Northern Ireland, and further afield (in the UK and Ireland).

It is essential to have a clear and comprehensive picture of what training and courses are available across the province, and also across Ireland and into the UK as individuals may choose to access these courses.

Northern Ireland

University/ Institute	Course	Detail
University of Ulster	Building Services and Energy Management BEng / MEng	This course provides the underpinning education in preparation of becoming a Chartered Engineer. Year One covers thermofluids, controls, mechanical plant and systems, water resources, environmental health aspects and design tools. Year two studies include mathematics, electrical and energy engineering, environmental issues and impacts and entrepreneurship. The third year of the course is spent in industry on placement. Year 4 studies include an in-depth design project, heating and ventilation and energy management, procurement, environmental engineering and an in-depth dissertation by personal research.
University of Ulster	Renewable Energy and Energy Management, Postgraduate Diploma/MSc	Modules in Solar, Thermal, Photovoltaic and wind technologies. (Accredited by CIBSE and the Energy Institute)
Belfast Metropolitan College	Building Services and Renewable Energies, Foundation Degree	Modules in Solar Technologies, Energy Resources and Renewable Technologies and Engineering Maths and Economics (Awarded by UU)
Queens University Belfast	Electrical and Electronic Engineering, BEng	Includes modules in; Electrical Engineering Principles; Electrical Instrumentation; Electric Power. Queen's is one of only seven UK universities involved in the prestigious Power Academy scholarship scheme. Each year this provides 60 generous scholarships worth over £20,000 each to well-qualified students on the BEng and MEng degree pathways across the seven member universities.

South West Regional College	Wind Turbine Specification and Installation	This course will examine energy generation from wind sources. It will cover topics such as site selection and Wind Energy Engineering covering electrical generation from Wind Energy and Grid Connection

Republic of Ireland

University/ Institute	Course	Detail
University of Limerick	Science in Energy	Core Aspect Power and Energy Management covering Sensors/Actuators, Control,Wind/Ocean/Hydro,Resource Assessment, Hydro Carbon Energy, Power Electronics Environmental Management, Energy Efficient Buildings,Electronic Systems for the Built Environment,Project Planning.
University of Galway (NUI)	Engineering (Energy Systems Engineering)	Modules in Renewable Energy Technologies, Energy Systems in Buildings Sustainable Construction, Bioenergy, Energy in Buildings
University of Galway (NUI)	Engineering (Environmental Engineering)	Module in Sustainable Energy and Environmental Systems
University of Cork	Energy Engineering	Modules in Energy in Buildings, Sustainable Energy, Wind, Hydro and Ocean, Biomass, Solar and Geothermal etc
University of Dublin (UCD)	Graduate Certificate in Green Technologies	Modules in Advanced biofuels and renewable energies, waste management
Limerick Institute of Technology	BSc Renewable and Electrical Energy Systems	Modules in Renewable Energy Systems, Power Conversion Building Energy Ratings. (No accreditation)
Limerick Institute of Technology	BSc Sustainable Energy Management	1 year follow on course from BSc Renewable and Electrical Energy Systems or any BSc in Science or Engineering. Modules in Commercial BER, Building Energy

		Management and Sustainable Energy
Galway Institute of Technology	BEng Energy Engineering	Modules covered include Energy Technologies and Installations, Building Energy Ratings and Energy Analysis. After Year 2, students graduate with Higher Cert in Energy Engineering and are approved by SEI as certifiers or installers of energy systems. Graduates with the degree may register with SEI as Assessors of installed energy systems. Third year graduates eligible to apply to become BER assessors.
Institute of Technology, Tallaght	BEng Energy and Environmental Engineering. (New course Sept 2009)	Three year course. Modules in Energy Systems Design, BER and Renewable Energy Systems.
Institute of Technology, Blanchardstown	BSc Sustainable Electrical and Control Technology	Three year course. Modules include Sustainable Technology, Electrical Power and Machines and Energy Management. Emailed dept to see if any accreditation for technicians of course.
Dublin Institute of Technology	BSc Electrical Services & Energy Management	Modules include Energy Management, Utilization of Electrical Energy and Data Acquisition, Analysis & Energy Modelling.
Cork Institute of Technology	Wind Energy	Twelve week course. Subjects covered include Wind power theory, Wind generator construction, selection and sizing and Prediction and monitoring of wind turbine output. No accreditation from City &Guilds or SEI
Cork Institute of Technology	Introduction to Sustainable Energy Systems	Twelve week course. Introduction to renewable energy systems and BER.
Cork Institute of Technology	BEng Sustainable Energy Technology	Modules include Wind Energy, Sustainable development, Environmental and Energy

		Engineering etc
Cork Institute of Technology	Certificate in Sustainable Energy Systems	One year course. Modules covered include Sustainable Energy Systems and Climate Change and Energy
Athone Institute of Technology	BEng in Mechanical Engineering & Renewable Energy	Three Year course. Modules include Renewable Energy Systems, BER, Energy Management and Environmental and Business Management.
Waterford Institute of Technology	Introductory Certificate in Sustainable & Renewable Energy	Ten week course. Overview of renewable energy sector. Modules include Energy in agriculture and introduction to sustainable energy. Have wind turbine on campus and biofuel research cluster
Dundalk Institute of Technology	MSc Renewable Energy Systems	Covers modules which include Wind Energy, Solar Energy, BioEnergy and water energy.
Dundalk Institute of Technology	BEng Building Services	Three year course. Covers energy efficiency and renewable energy.
Dundalk Institute of Technology	Vestas V52 Turbine Training	Five day course covering Mechanics, hydraulics, Electrics and Controls — to a level of a lead Technician/ CT Technician. No practical element
Dundalk Institute of Technology	Vestas V-52 Maintenence Training	Two day course. No practical element
Letterkenny Institute of Technology	BEng Building Energy, Services and Design	Modules include Renewable Energy Technologies and Sustainable Construction & BER. (Can apply to SEI for registration as Energy Assessors for New Dwellings.)
Letterkenny Institute of Technology	Higher Certificate in Wind Energy	30 month programme. Six month work placement included.

Private Training

University/ Institute	Course	Detail

Chevron Training	Wind Turbine Courses	Modules include Introduction to wind, regulations, site assessment, capturing wind.
GL Garrad Hassan	Onshore and offshore wind training courses	Courses include software training (GH WindFarmer, GH Bladed), Financing wind farms, wind farm development, offshore wind energy, wind farm safety and wind farm electrical systems.
FIT	Course for wind farm technicians	The duration of the course is 8 months; 6 months training followed by 2 months work experience (there is already, in principle, buy-in from industry)

Mainland Britain

University/ Institute	Course	Detail
University of Aberdeen	Mechanical and Electrical Engineering with Energy Studies MEng	5 Year honours degree programme. Undertake a project in third year either in Aberdeen or abroad in the area of chosen specialism
University of Aberdeen	Energy Futures (Renewables) MSc	A programme designed to provide students with a detailed knowledge of the technology required to ensure energy provision in the Renewable Energy industry. Students gain both a theoretical and practical grounding for future managers of energy projects.
University of Bath	Electrical Power Engineering BEng / MEng	The aim of this degree programme is to satisfy the needs of both the industrial and research communities. This is achieved by equipping the next generation of power engineers and power system economists with the skills and knowledge required to meet the challenges of delivering sustainable, secure and affordable electrical power supply to consumers over highly complex and integrated power

		networks.
Birmingham University	Electrical and Energy Engineering, B.Eng (Hons) /MEng	Includes an integrated set of modules addressing a breadth of energy issues, as well as highlighting important interactions with the other relevant engineering disciplines. A year-long industrial placement is available adding a year to the duration of the degree and can lead to the award of a Certificate in Industrial Studies.
Birmingham University	Materials Science and Energy Engineering, B.Eng /MEng	Involves an individual research project (BEng) or a multidisciplinary project (MEng). A ten-week paid industrial or laboratory placement at the end of the second year allows students to put all their skills into practice; eligible students can choose the MEng programme, which involves a six-month industrial project in the fourth year.
University of Cambridge	Engineering (Energy and the Environment) MEng	The aim is to develop rigorous processes for integrating the consideration of economic, social and environmental factors when assessing sustainability of options, building these processes into engineering design, and creating new solutions for true sustainability.
University of Central Lancashire	Sustainable Energy Management, BSc (Hons)	Studies energy usage and management in the context of the modern built environment. It aims to provide students with up-to-date professional and academic training in sustainable energy management that is relevant to a career in sustainable development of the built environment. Studies included involve the identification, analysis, evaluation and subsequent solving of problems associated with the built environment and associated engineering

		systems, typically including building services systems, controls and plant, energy efficiency and sustainability, and project, resource and energy management issues.
City University, London	Energy Engineering BEng / MEng	Full time programme which includes an industrial placement. Includes modules in electrical engineering and engineering management.
Coleg Llandrillo, Cymru	Renewable Energy Technology, Foundation Degree	Two year programme includes modules in: • Building Services • Energy & Power Systems • Implementing & Managing Services • Procurement & Contracts • Renewable Energy
Cornwall College	Renewable Energy Technologies, Foundation Degree	Covers a wide range of topics to equip students with the skills and knowledge required for a career in Renewable Technologies. The course includes the following modules: Planning for Energy, Economics of Sustainability, Energy from Wind and Waves, Sustainable Construction, Project Management.
Coventry University	Global Sustainability, BSc (Hons)	Drawing on a combination of lecture-based, practical, field and vocational learning, the programme introduces the principles behind sustainable development and examines the issues, problems and practicalities associated with attempting to secure it at a range of spatial scales.
Cranfield University	Offshore Renewable Energy	Modules include Offshore Renewable Energy – Technology, Offshore Renewable Energy – Management.
CREST at Loughborough College	MSc in Renewable Energy Systems Technology	Modules covered include Solar, Wind and Biomass. CREST is a partner in the European

		Master of Science in Renewable Energy led by the EUREC Agency. Students can attend the first semester at Loughborough University. They then study at one of the partner institutions where they can specialise in particular renewable energy technologies. Further details about this course can be found at www.master.eurec.be.
CREST at Loughborough College	CREST Wind Power Short Course	Five day short course. Modules covered include Wind Turbine Technology, Power Transmission and Network Fundamentals etc.
University of Cumbria	Energy Engineering, BEng	Modules studied include mechanics, materials, thermodynamics, engineering mathematics, design, electrical and control engineering, renewable and nuclear energy
University of Cumbria	Renewable Natural Resources (Top-up)	Convert Foundation Degree Eng into full BEng
De Montfort University (Leicester)	MSc - Energy and Sustainable Development (IESD)	Modules include Energy in Buildings, Ventilation and Airflow Modelling, renewable energy and sustainable development.
De Montfort University (Leicester)	Climate Change and Sustainable Development	Modules include Energy in Buildings, Sustainable Development, Renewable Energy
De Montford University (Leicester)	Green Energy Technology: BSc Honours	Covers green energy technology, carbon trading and a final year project which may be along the lines of analysis of using bio-diesel in a real engine
University of Dundee	BSc and MSc Renewable Energy	Modules cover the operation of conventional power stations and the National Grid, solar cells, wind and tidal energy and geothermal sources
Durham University	MSc New and Renewable Energy	Modules covered include energy generation and conversion technologies, energy delivery and network integration and renewable energy and the environment

University of East London	Renewable Energy and the Built Environment.	Modules covered include PV, Hydro, biomass and windpower.
University of Edinburgh (School of Engineering and Electronics – Institute of Energy Systems)	Sustainable Energy Systems, MSc	Modules in Technologies in Sustainable Environment, Energy efficiency, resource and environment.
University of Edinburgh	Mechanical Engineering with Renewable Energy BEng/MEng	Covers mechanical and renewable energy engineering.
Edinburgh University	Engineering for Sustainable Energy BEng / MEng	Designed to equip graduates and working professionals with a broad training in, and understanding of, energy production, delivery, consumption, efficiency, economics, policy and regulation. These are considered in the context of the sustainability of energy supply and consumption patterns, both locally and globally.
Edinburgh University	Mechanical Engineering with Renewable Energy BEng / MEng	The aim of this degree programme is to produce engineering graduates who have a strong grounding in the core Mechanical Engineering subjects, but also have a good background in energy studies, together with an understanding of the social and economic aspects of energy policy.
University of Exeter	Renewable Energy BEng / MSc	Modules include solar, wind and hydro power, energy storage technologies and energy legislation and regulations. In 2006 the UK's first ever renewable energy students graduated from this course.
University of Glamorgan	MSc Renewable Energy and Resource Managment.	Covers wind, solar, bioenergy, energy and environmental policy and legislation.
Glyndwr University	BEng Renewable Energy	Modules include energy storage and

(North East Wales Institute of Higher Education)	and Sustainable Technologies	bioenergy generation and energy power and generation.
Glyndwr University (North East Wales Institute of Higher Education)	FdEng Renewable Energy Systems	Covers electrical and mechanical science, renewable energy systems and construction technology
Heriot-Watt University, Edinburgh	Mechanical and Energy Engineering BEng / MEng	. Students will acquire skills to take responsibility for decision making where energy and the environment are important issues. Building on a sound engineering foundation, students will be introduced to specialised energy topics, management and environmental impact assessment.
University of Huddersfield	Energy Engineering BEng / MEng	Bridges the electrical and mechanical subject areas. Offers the option of a placement year. The MEng course is accredited by the Institution of Mechanical Engineers (IMechE) and allows students to apply for Chartered Engineer status early in their career.
Lancaster University	Sustainable Engineering , MEng	The Sustainable Engineering course will give a broad engineering background with a focus on sustainability issues to produce graduates with a strong sense of the relative impact of engineering processes on the natural environment.
University of Leeds	Electrical Engineering and Renewable Energy Systems, MSc (Eng)	Covers efficient generation and use of electricity from solar, wind and wave power and integration of renewable generators into micro-grids, with stability analysis and active power management.
Liverpool John Moores University	Energy Management and Sustainability, BSc (Hons)	The BSc (Hons) Energy Management and Sustainability is a skills-rich programme

		designed to produce a high-quality graduate technologist with a wide range of skills. Students will receive a high level of hands-on practical activities. Extensive use is made of laboratory work; case studies, projects, practical assignments and problem based learning activities.
Liverpool John Moores University	Mechanical and Marine Engineering, BEng (Hons)/ MEng	Covers modules in: Design and manufacture; engineering principles; engineering mathematics; professional development, business management for engineers; engineering design; electronic engineering; power plant; ship technology; marine machinery design and operations.
University of Manchester	Electrical and Electronic Engineering with Industrial Exp. BEng / MEng	Course content recently updated in collaboration with industrial Advisors to ensure that it remains relevant to industry and that graduates continue to be highly sought after by recruiters
Napier University, Edinburgh	BEng (Hons.) Energy and Environmental Engineering Department of Mechanical Engineering	Modules include Renewable Energy & Sustainability, Energy Systems Design and Advanced Energy Systems.
University of Newcastle	MSc Renewable Energy	(Flexible Training Programme) Modules covered include Biomass and waste technology, wind and hydro, PV and geothermal.
University of Newcastle	MSc Renewable Energy, Enterprise and Management	Covers modules in Wind energy, project management and renewable energy policy. Includes a project which can be done on subjects including wind energy generation.
Newcastle University	Offshore Engineering, BEng (Hons)/ MEng	Developed in consultation with the offshore industry in order to meet its increasingly

		specialist demands; includes modules in marine engineering, offshore engineering analysis and business and management subjects.
University of Nottingham	Renewable Energy and Architecture, MSc	Have completed a lot of research into wind and built environment. Also set up an environmental technology centre in 2000. Have campuses in Malaysia and China. Modules in Renewable Energy technology, energy efficient systems.
University of Nottingham	Electrical Engineering and Renewable Energy Systems, BEng/MEng	Covers power generation from renewable sources, and future energy infrastructure.
University of Nottingham	Sustainable Energy and Entrepreneurship, MSc	Modules include Renewable Energy Technology and energy management and policy.
University of Nottingham	Sustainable Building Technology, MSc	Modules include Energy Efficient Systems Energy Conversion and Utilization, Combined Heat & Power Systems
University of Plymouth	Electrical Engineering & Renewable Energy, Foundation Degree	The demand for electrical engineers with specialist knowledge in renewable energy outstrips supply. This foundation degree is very practical and is taught within a workshop environment.
Queen Mary, University of London	Sustainable Energy Engineering, BEng (Hons) / MEng	Includes modules in: Aspects of energy engineering; engineering mathematics; electrical technology; structural analysis; Individual design and research project; Design of engineering systems.
University of Reading (Energy Group in the Department of Engineering)	Renewable Energy and the Environment, MSc	Modules include Energy, Carbon and the Environment, sustainable heat and power and carbon management.

University of Reading	Renewable Energy, MSc/PgDip	Modules include energy, carbon and the environment, sustainable heat and power, and energy in buildings.
Robert Gordon University, Aberdeen	Mechanical and Offshore Engineering, BEng(Hons)	The course will introduce students to the principles and fundamentals of mechanical engineering. This knowledge will then be applied to the Offshore Engineering specialism. Offshore Engineering involves the study of oil and gas exploration and recovery, platform design, pipelines, down-hole instrumentation and energy transformation.
Robert Gordon University, Aberdeen	Electrical and Energy Engineering, BEng(Hons)	Electrical engineering involves the technology of power generation and transmission, electrical generators, motors, the development and operation of renewable energy schemes and environmentally friendly engineering systems.
Salford University	Water, Energy and Waste, MSc/PgDip/PgCert	Modules for this include renewable energy, solar wind and water power, waste management and waste management technology/
Sheffield Hallam University	Energy Engineering for Sustainability, BEng (Hons)	Develops skills in modern mechanical and electrical engineering applied to the challenge of sustainable energy provision and consumption. You learn to design, analyse and develop control energy systems for the generation, storage and distribution of electricity and heat. You gain expertise in renewable energy systems, including • photovoltaics (solar power) • wind • wave • geothermal • biomass • tidal • hydro. You learn about integrating them into conventional energy systems and the sustainability of their operation.

Strathclyde Glasgow	Energy Systems and the Environment, MSc	Modules include electrical power systems covering power generation from renewables and energy modelling and monitoring.
University of Southampton	Sustainable Energy Technologies, MSc	Modules include Fuel cells and photovoltaic systems 1 and 2, Introduction to energy technologies, Advanced electrical systems.
University of Southampton	Mechanical Engineering/Sustainable Energy Systems, MEng	Gain an overview of modern energy technologies, including renewable energy sources, fuel cells, nuclear engineering and energy economics. Number one in The Guardian University Guide 2010 for mechanical engineering; Strong links with industry provide excellent opportunities for work experience and employment.
University of Southampton	Environmental Engineering BEng/MEng	Contains specialised modules for wind energy.
University of Strathclyde	Electrical Energy Systems, MEng	Aims to produce highly skilled engineers with the capabilities and technical expertise to deal with issues surrounding the supply of electrical energy and the applications of electrical power and renewable technologies.
UHI Millennium Institute	Engineering Renewable Energy, BSc	Learning is through a combination of face-to-face lectures, tutorials, and experimental work, along with some online study via the VLE. An extensive on-site facility including wind turbines, solar PV and hydrogen production facility is used to show the operation of real systems.
University of the West of England (Bristol)	Climate Change and Energy Management, BSc (Hons)	Between May 2006 and May 2007 the number of specialist jobs relating to climate change increased by 130 per cent, largely resulting from heightened awareness of the need for

		carbon management within major companies. There is a shortfall of qualified workers in this sector, and this course aims to provide students with the knowledge and skills to make an immediate contribution to the job market. This is a new degree, launching in September 2010.
University of the West of England (Bristol)	Electrical and Electronic Engineering, BEng/MEng	Includes a professional Studies module which helps students to bring a professional approach and attitude to your studies. It includes project planning, group work and communication skills, all considered highly important by prospective employers.

9.3.2 IWEA Wind Skillnet

A list of training courses organised by IWEA through Wind Skillnet in February and March 2010 is presented below to give an understanding of where operators in Ireland have requested training. Unless stated otherwise, the duration of each course is one day.

Month	Course Title	Date
February 2010	Pre Construction Documentation Required to Obtain Finance for Windfarms	2nd
	Grid Connections	14th
	Time Management	16th
	Legal Issues in Wind Farm Development	18th
	Wind Farm Electrical Systems	23rd
	Grid Connections 2	25th
March 2010	Introduction to GH WindFarmer	2nd
	Presentation Skills	3rd
	Project Management	8th
	Negotiation Skills	9th
	Value Risk Management	11th
	The Planning of Wind Farm Developments	15th
	EIS & Planning	18th
	Introduction to Wind Energy	22nd
	Wind Energy 1	29th
	Technical Report Writing	30th & 31st

9.3.3 Emergent points

- There is considerable diversity in terms of the content of courses, how courses are delivered, and the qualifications available.

- Some courses which are technically focused also include some business and management options; this is in recognition of industry demands, and part of an overall aim to improve employability of course graduates.

- While listed above are courses specific to the renewables sector – and even more specifically in some cases, large scale wind energy generation – education providers were keen to point out that there are existing or broader courses which have elements of renewables content but are not exclusively 'renewables specific'. For example, an electrical or mechanical engineering course with modules providing a renewables context. While on the one hand this is indicative of the suitability of some existing provision for transfer to the renewables sector, on the other it demonstrates that there is also an element of uncertainty about the industry with some providers. In a Northern Ireland context, it is interesting to consider the Foundation Degree offered at Belfast Metropolitan College in Building Services and Renewable Energies. The course conveners kept the course broad, with the emphasis on building services with renewables added on; this is so that if the graduates of the course cannot find employment in the renewables sector they can go into building services more broadly.

- In discussion, it emerged that all training providers foresee an increased demand for education and training relevant to large scale wind energy generation, particularly in the field of operations and maintenance technicians. They are keen to collaborate with industry to secure ensure that supply is tailored to demand.

- Courses have emerged organically in the absence of any defined structure. Gaps in provision are common with an organic growth pattern. The introduction of the National Occupational Standards for Power will provide the necessary structure against which to benchmark existing courses and identify areas of under provision.

9.4 Provision in Northern Ireland

Outlined below is a brief synopsis of some of the courses available within this sector within Northern Ireland, and where appropriate, in the Republic of Ireland or the UK (due to their proximity). The courses are identified by the type of qualification or training offered, and for each an assessment is made of who the particular course is geared towards, what the course entails, and where graduates of the course will go to (further training/education or employment). In examining the educational picture in detail, we can begin then to identify gaps in provision, whether this is in catering to a particular market (for example, school leavers or seasoned professionals) or from an industry perspective (for example, if a qualification or training programmes is lacking that is seen as valuable to the industry).

9.4.1 Short Courses

These short courses are likely most useful to people who are either already working in the sector, but are keen to broaden their knowledge and understanding, or to those who have pursued a career in a related industry (for example the petrochemical industry, or general electrical or mechanical engineering) and have the necessary transferable technical skills, but need to gain an understanding of large scale wind energy generation.

1. South West College, Carbon Zero NI

This is a four day course, providing participants with the skills and knowledge needed to:

- Select sites for wind turbines and analyse the suitability of a site
- Calculate the economic return of a turbine
- Understand different wind turbines and how they operate.

This short course is probably of most value to individuals who already have a background in a related field, but are keen to move into the renewables sector. It is not aimed at providing individuals with any technical training, but would be very valuable in providing perhaps to technicians a business overview and an understanding of the wind farm development process, from site selection through to overall operation.

Course participants sit an exam on the final day, and the course is fully accredited. It is run only through South West College.

2. GL Garrad Hassan

GL Garrad Hassan are a global engineering consultancy and training provider specialising in renewables. GL Garrad Hassan currently offers 13 courses on topics including 'Wind Farm Design', 'Offshore Wind Energy' and 'Wind Farm Safety'. Two further courses are in development (responding to perceived industry desires). These courses tend to last for one day, except for 'Wind Farm Development' which runs for two days, and 'GH Bladed' (designed for users of the GH Bladed software package) which last for five days. Course attendees receive internationally recognised GL Garrad Hassan certificates.

The courses are aimed at people entering the large scale wind energy industry from a directly related industry, for example engineers in the oil and gas industry keen to move into the renewables sector. Additionally, they are aimed at people already working in the sector, but looking to up-skill, improving their career prospects for example engineers keen to move into project management, or at wind farm owners or developers looking for an overview of the various job and skill components required to successfully develop, run and operate a wind farm.

9.4.2 Foundation Degree

1. Belfast Metropolitan College

The Belfast Metropolitan College offers a Foundation Degree in Building Services and Renewable Energies. It is a very new course and the first graduates will emerge later this year (2010). The degree is accredited through the University of Ulster.

The course syllabus suggests that the real emphasis of the course is on building services, with modules in renewables added on. It was noted that the course is being kept broad as a kind of 'safety net', so that if graduates of the course cannot go into the renewables sector, they can go into building services more broadly. Of relevance to large scale wind energy generation is a module in 'Wind, Geothermal and GSHP'.

The course includes work and project based learning, where students complete work placements with local companies; this is a very useful element of the course, as employers are keen to recruit people not only with a relevant qualification, but also with appropriate and relevant experience.

This course would likely appeal to school leavers and those starting out on their career, as opposed to people who already have related experience and are keen to move sideways into the industry.

The course convenors anticipate that a considerable number of graduates of the foundation degree will likely go on to complete a full degree with the University of Ulster. Those who go directly into employment will most likely go into consulting, contracting or maintenance in the renewables sector. However, these graduates will not have the technical knowledge to go into wind turbine operations and maintenance, but would need further training in electrical and mechanical engineering.

9.4.3 Undergraduate Programmes

Undergraduate degree programmes are most likely to be useful to school leavers, and people starting out on their career paths, rather than experienced individuals who already have a career and experience in a related sector, but are keen to move sideways into the renewables industry.

1. University of Ulster

The University of Ulster offers a BEng programme in Energy and Building Services Engineering. The course is accredited by the Energy Institute and CIBSE. Modules in mechanical and electrical engineering are taught concurrently with 'wind' modules which are particularly focused on the knowledge and skills needed to design and develop wind farms.

Applications for the degree programme tend to come from school leavers, who are keen to embark on a career in the renewables industry. Graduates of the programme are currently going into fields such as consultant engineering. A considerable number of undergraduates go on to complete the MSc, and these students are more likely to go into the renewables sector.

Graduates of the programme are very attractive to employers, and some such as Siemens and Scottish and Southern Energy actually sponsor some students to complete the MSc. Graduates are able to go into a number of fields within the sector, ranging from operations and maintenance, through to more advanced technologist positions, and onto project management.

2. Queens University Belfast

Queens University Belfast (QUB) offers the following courses in electrical engineering:

- BEng in Electrical and Electronic Engineering (4 Year Sandwich)
- BEng in Electrical and Electronic Engineering
- MEng in Electrical and Electronic Engineering (5 Year Sandwich)
- MEng in Electrical and Electronic Engineering

QUB does not currently offer a course on renewable energy but in recognition of the breadth of the subject, a number of new specialist courses are being introduced, allowing students to customise and specialise their degree qualification. One of these specialist courses will be:

- **MEng/BEng Electrical and Electronic Engineering with Renewable Power and Energy**

It would be a technical qualification designed for electrical and mechanical engineers as a bridge between existing disciplines and the renewables industry.

9.4.4 Higher Certificate / degree equivalent programmes

1. Letterkenny Institute of Technology

Currently, Letterkenny Institute of Technology offer a Higher Certificate Wind Energy Technology programme which is a part-time 30 month programme including a 6 month internship / work placement. It provides participants with the equivalent of a foundation degree. It is typically geared towards people with a background in mechanical or electrical engineering offering them an opportunity to re-educate and up-skill. This is designed to tap in to the large numbers of people keen to move sideways into renewables from related industries (for example, oil and gas, or conventional electrical engineering).

From September 2010 however, LyIT will be offering a full time Level 6 / Level 7 Wind Energy Technician Programme with accreditation from BZEE. This course includes a 6 week work placement / internship with companies including B9 Energy, Siemens, Nordex and Scottish and Southern Energy.

LYIT propose to offer a Level 7 Bachelor of Engineering programme in Wind Energy Technology in the near future. This programme will be a three year full-time programme and will accept people with A-Levels / Leaving Cert. and provide them with hybrid general training in electrical / mechanical engineering, with BZEE training and incorporate training to technologist level. Level 8 is the eventual target however there are no plans to go into a technical Masters Degree programme.

These programmes will appeal to school leavers as opposed to experienced professionals or skilled workers, and will produce graduates with the knowledge, qualifications and experience (gained through the work placement and from the 26m training turbine planned for the campus) to go directly into working on a wind farm, at a number of different levels from operations and maintenance, through to technologist level, up to project management.

9.4.5 Postgraduate Programmes

The market for postgraduate programmes will consist of both recent graduates, and individuals who have spent time in a related industry and have graduated some years previously. Postgraduate programmes tend to be more specialised, and as such, graduates of renewables postgraduate programmes are very likely to be employed in the renewables sector.

1. University of Ulster

Postgraduate programmes at the University of Ulster range from the MEng and MSc programmes through to a PhD. Graduates of these programmes are very likely to go into the renewables sector, with some companies such as Siemens and Scottish and Southern Energy actually funding students on the courses, who will then go to work for those companies.

These courses are intended to deepen and enhance students' knowledge and understanding of the renewables sector.

2. Dundalk Institute of Technology

The Masters involves a lot of training in theories, involves completion of a thesis and training in the use of small wind turbines. There is also a focus on using wind farm design software. The course lasts for a year, and then students undertake a 6 month taught thesis.

Each year, the intake for the course is 20 students, which tends to winnow down to about 17 or 18. This is from a pool of at least 80 applicants. The requirements are an honours degree in a technical subject, and then he looks for variety for example a mix of men and women and a variety of ages.

Companies approach DIT for graduates for example ESB International, and Airtricity. Some students have ended up in New Zealand and Australia, in wind turbine related jobs and directly related fields.

The course is aimed at people who will go on to be employed as project engineers and technicians.

9.5 Key Themes

Having examined the courses and training available, some questions emerge:

- Are each of these courses fit for purpose, and for whose purpose?
- On what key areas do the courses diverge?
- How responsive are these courses to the changing dynamics and evolution of the industry?

If the purpose of these courses is to produce graduates who are attractive to employers within the sector, then it is vital that education providers appreciate what employers want from job applicants, and apply this knowledge to their provision. Inevitably, different employers require different things from their employees, and hence look for different skills and qualifications from those who apply to work for their company. As such, while there is a wide variety of courses identified above, ranging from 4 day introductions to wind turbines, through to Masters Degree programmes, each of these may be fit for a particular purpose.

9.5.1 Balancing academic rigour with experience

Employers are keen to source people not only with a relevant degree or qualification, but also with the ability to "hit the ground running". The priority is to recruit individuals who not only have the necessary knowledge and technical awareness, but also an understanding of how to apply this knowledge, and put theory into practice. As employers feed this requirement into the education system, education providers are keen to respond and provide their students with as much experience as possible.

At the Belfast Metropolitan College, the Foundation Degree includes a module of work based and project based learning, where students are expected to complete a work placement with a local company.

Professor Brendan Fox at Queens noted that companies continually request people with relevant work experience, and are keen to attract graduates from courses where experience is incorporated with the academic, however companies must in turn be ready to offer opportunities to undergraduates, enabling them to develop this experience.

A course for wind turbine technicians, explicitly combining academic training with hands-on and work-based experience has been developed by FIT, who are based in Dublin. The pilot course is

being launched at the end of this month (April 2010) and will be followed closely with any developments incorporated into this report. The duration of the course is 8 months; 6 months training followed by 2 months work experience.

Letterkenny Institute of Technology are currently seeking planning permission for a 26m wind turbine, blades and nacelles, which will provide their students with invaluable experience on a turbine, and in working at height. Additionally, a key component of the course is a 6 week work placement in industry with companies such as B9 Energy, Siemens and Scottish and Southern Energy. These aspects of the course compliment the academic elements with the addition of crucial experience; something which all employers seek in job applicants.

The degree of hands-on or experience based work required from a course is likely to depend on who the course is being marketed to. For example, short courses such as those offered by GL Garrad Hassan are aimed at people who already have considerable experience within this or a related industry, and as such experience based modules are not as important as they are to, for example, school leavers embarking on an undergraduate degree as they will have little or, more than likely, no experience in the field.

9.5.2 Broad versus highly specialised courses

Some educationalists argue the importance of educating on the wider course issues rather than towards any particular career. Some are keen to maintain broad courses, for example in electrical engineering or building services, with the addition of renewables elements. For example, the course convenors of the Foundation Degree in Building Services and Renewable Energies at Belfast Metropolitan College (a new course, with the first graduates emerging later in 2010) are keeping the course broad as a 'safety net'. If graduates of the course do not find the opportunities they are looking for within the renewables sector, they can go into building more broadly. Queens University Belfast views 'renewables' as a multi-disciplinary sector, and considers it inappropriate at this stage to introduce a specific 'Renewables Engineering' course, considering it to be:

"too risky to have a four year renewables degree at this stage."[39]

Rather, the industry should maintain a flexible approach to electrical engineers; electrical and power engineering specifically for the renewables sector would be too 'niche'.

Conversely, it is evident that the renewables sector specifically is an attractive and appealing industry. As government targets have been introduced for generation of energy and electricity from

[39] QUB meeting

renewable sources, and as the number of wind farms –on and off shore –increase, awareness of the wide variety of opportunities within the sector is more apparent. In light of this, the number of courses and degrees devoted to renewable energy and technologies, or even more specifically to large scale wind energy generation, is increasing; the new Wind Energy Technician programme being launched by Letterkenny Institute of Technology being just one example.

This divergence can to a large degree be explained when we consider the different groups of individuals hoping to embark on careers within the sector. For someone who has perhaps worked for many years in a related industry some of the broader courses offering may not be necessary; while they have the necessary transferable skills, they require specific wind energy training to facilitate their career path. Conversely, a recent school leaver who is keen to become a wind turbine technician will require not only training in wind turbine operations and maintenance, but also an education in the electrical and mechanical engineering components required for the job.

9.5.3 Challenges to provision

Three main challenges were identified by education providers as potentially impacting what they can offer to students.

- Industry engagement to identify the relevant course provision
- Funding and facilities available
- Human resources – 'training the trainer'

Industry Engagement

Education and training providers are unwilling to invest in course set-up, materials, instructors and facilities unless they are confident that they will see a return on their investment. This can be assessed in terms of how attractive graduates of the programme are to industry and in turn how attractive the programme is to potential students. To secure this confidence, industry needs to engage with training providers and communicate what elements they require and what they desire from training programmes.

Funding and Facilities

The facilities and resources a training provider can offer tend to depend on the availability of appropriate funding. This is a concern shared across the spectrum by FE Colleges, the Universities and private training providers.

- **University of Ulster:** the course convenors at the University of Ulster would be very keen to install a wind turbine on campus, so that the students on their various courses could gain hand s on experience in the mechanics and tork of the turbine, however the funds are not available. Additionally, a company called Eridian, based in Spain produce equipment such as a power simulator, through which a simulated wind farm can be operated. Again, this is perceived as potentially very useful to University students, but at a cost of £100,000 it is simply too expensive.
- **Dundalk Institute of Technology**: would like to see more funding for their Masters programme. The course costs €13,000 for a year and a half, and many students are self-financing. This is obviously a potentially prohibitive cost for many students, and could prevent people who might otherwise have wanted to undertake the Masters, from applying.
- **Belfast Metropolitan College:** as with the University of Ulster, it can be challenging accessing funding for the facilities and equipment that they would be keen to incorporate into the course. When the programme was first planned, the intention was to have a 20kw turbine for training purposes; this has had to be scaled down to 6kw.
- **FIT**: are looking at workshop premises in Mayo and Donegal. Currently, equipment is costing in the region of €222,000, and the training cost of the course will be approximately €250,000 on top of which are the placement costs.
    - The FIT attitude is very much to promote collaboration of funding, actively pursuing a combination of funding from
        - Government
        - Private sector (sponsorship) and industry buy-in
        - External training contracts

An important consideration is whether, particularly with regard to facilities and resources, courses need necessarily be 'site-centric', or can they be more 'student-centric'. For example, the South West College is currently the only one of the regional colleges to offer a course for wind technicians. The course runs for four days during the week. This is logistically very difficult for individuals from other parts of the province who would like to attend this course. It would perhaps be more convenient for students if they could access this course at another site. Obviously, this depends on what facilities or resources are required for the course. However, if these could be provided at another site then the course may be opened up to individuals from other parts of the province.

One solution to the issue of funding for desirable facilities and resources (for example, a wind turbine training tower) may be active and open collaboration. For example, if a number of education providers came together to fund a piece of equipment, this could then be accessed and used by each of them.

Human Resources

Human resources have emerged as a challenge to education and training providers in enabling them to maintain their current course offers, and potentially extend these or offer other programmes in the future. The challenge is two-fold: firstly, that staff with the necessary qualifications and experience are difficult to source, and; secondly, that where staff are also working on their own research projects they find it difficult to fit in teaching time.

This was identified early in the research, following discussion with the South West College and was subsequently an issue raised at each meeting. It was the experience of South West College that in instituting a new course to train wind turbine technicians, it was necessary to recruit a lecturer specialising in wind energy; this proved a challenging task with the position having to be re-advertised. While the position has now been filled, this highlighted the matter of 'training the trainer'.

Similarly, Dr Philip Griffith at the University of Ulster identified a recognised weakness of some courses as being insufficient in electrical engineering content. It can be difficult to overcome as an electrical engineer is necessary to teach the course.

At the Dundalk Institute of Technology, some applicants are turned away each year due to insufficient human resources to accommodate everyone that the school would like to accept. With an average of 80 applicants in the past few years, the intake for the course is approximately 20. There are not enough staff to teach more students. Ideally, teaching staff will combine an academic background with industry experience, and these people can be very hard to come by. It is a particular challenge getting thesis advisers; some are sent to advisers at other universities for example University College Cork however this can limit the choices students have for thesis topics. Also, each thesis still has to be signed off by DIT.

The picture is similar for private independent training providers such as GL Garrad Hassan. The main challenge identified to their training provision is human resources. They have found it to be a challenge accessing staff both nationally and internationally. As a training provider, GL Garrad Hassan is restricted by the range of staff they have in particular countries. While sometimes staff

can travel if needed, this is not always feasible and can restrict availability of courses in certain areas.

It is important that education and training provision is demand-led, rather than supply-led. If human resources challenges cannot be addressed, then there is a risk that the opposite will become the case. Provision will be determined by the resources available, so while industry may want a particular course to be on offer, or certain modules to be taught, if the teaching staff are not available then this will not be possible, and instead provision will be determined by the staff available. This is not a desirable situation, as companies will not be getting course graduates with the training they would like, and as such, course graduates may find it more difficult to find employment, or to progress within their career, than had the course been more directly informed and guided by the needs of the industry.

Training and education provision should not simply be geared towards producing individuals who will go on to work in the industry, whether in operations and maintenance, design, or project management, but also towards educating people will go into training or education.

9.5.4 Collaboration: Active Input from Employers

Employers in the sector seek individuals for a wide range of job positions, including:

- Electrical and power engineers
- Operation and maintenance technicians
- Project managers
- Site developers and financial advisers

Evidently, different skills and qualifications will be required for each of these (and the many other) occupations. In order to get job applicants with appropriate and relevant skills, training and experience, employers must be very clear in communicating their requirements to education and training providers.

Employers must take an active role and invest in the education of their current and future employees. This may involve accepting students on work placement or internship programmes, participating in joint industry / education forums where they can provide information on industry requirements, and also providing financial support whether in sponsoring students on courses or funding the establishment of training facilities. Employers must continue to value investing in their workforce, and also education and training providers must court industry input into their provision.

Given the nature of the sector – that it is constantly evolving, and encountering new developments – it is essential that industry involvement in and input into education and training provision should not be 'one-off', i.e. when a course is first established, or a syllabus first introduced. Rather, it should be a dynamic process with regular feedback, interaction and up-dates.

Collaboration and joined-up thinking were key themes which emerged from discussions with education and training providers; both amongst providers and between education and industry. This dovetails well with employer priorities already identified; to improve collaboration in the renewables sector within industry and also with training and educative bodies. From a training and skills development perspective, companies felt it was in their interests to work together and consult with training providers to devise the most effective solutions. This was evident through the Global Wind Alliance which brings together companies operating within the wind industry from Operations and Maintenance (such as B9) through to the design and maintenance of grid substations (Enersol) and education/training (South West College), under one alliance.

Between the various training providers

The South West Regional College have articulated their intention to set up a regular forum among the six regional colleges in Northern Ireland in relation to the provision of courses in renewables, with the purpose of sharing the workload and avoiding duplicated effort. This was echoed in discussions with the Belfast Metropolitan College, when it became apparent that there is a considerable degree of communication and cooperation between the various regional colleges. In discussion with Belfast Met it was noted that currently individual colleges are not always aware of actions taken and plans made by the other colleges. A regular forum would likely resolve this. Collaboration between training providers brought about the introduction of the Foundation Degree at Belfast Met, which is awarded through the University of Ulster. A considerable number of graduates of the Foundation Degree go on to complete a full degree with the University of Ulster.

Between Industry and Training Providers

Education providers felt a joined-up and collaborative approach with industry would be valuable both in setting course content to reflect the needs of industry, and in encouraging companies to support work experience or work placement programmes. The overriding view was that this should not merely be 'token' involvement, but that a collaborative environment and ethos should prevail, with real and on-going input in both directions.

There have already been significant steps taken towards achieving this:

- **Carbon Zero NI / South West College:** a collaborative initiative aimed at supporting skills development and job creation within the renewable energy sector within the province. It is led by the South West College, but brings together all six Further Education Colleges, as well as industry represented by NIE, Bombardier and B9 Energy, and is funded by the Department of Employment and Learning.
- **University of Ulster**: convene an advisory panel with members including university staff, and industry representatives from companies such as B9 Energy, AE Conn and Premier Power, as well as representatives from CIBSE and the Energy Institute. Their value is that they can feed in to the university about what the industry wants. They are out working in the industry, and some are graduates so can advise on how their degrees worked (or didn't work) for them.
- **Belfast Metropolitan College:** prior to finalising course content, three industry representatives were invited to consult on the curriculum; they are keen to get industry involvement in research and development.
- **FIT:** they are keen to pursue a strategic approach and develop the initiative across the whole of Ireland. Key to this is collaboration; not only with industry, but also with Government as well. Prior to producing the syllabus and course plan, FIT consulted extensively with industry representatives and bodies such as the EWEA and BWEA. They also went to wind farms and talked to wind turbine technicians. The course was built up block by block building on all of the information gathered through these consultations.
- **Queens University Belfast:** frequently consult with industrial contacts who have an input in the course syllabus. Several of the organisations with whom they consult accommodate graduates on work placements. Queens has been involved in research projects with B9 and RES previously. They are also participants in the Knowledge Transfer Programme where graduates work at a company or on industrial secondments.

Conversely, an interesting point was made at the Dundalk Institute of Technology, where the course director inferred that industry involvement was not really necessary in setting the course syllabus. The course is intended to be a broad Masters, and the concern is that input from specific industry bodies or companies may narrow the course content too much.

South West College Director, Malachy McAleer, said Carbon Zero NI's development of dedicated curricula would build on the successful activities already being carried out across the FE sector:

"Colleges in Northern Ireland are working hard to assist the development of sustainable technologies and skills. By pooling expertise and experience from all the colleges across the province, Carbon Zero NI will ensure everyone has access to the best training and facilities."[40]

9.6 Emergent points and conclusions: Provider Analysis

For the renewable energy market to be able to grow in a way that the growth in demand for energy requires there needs to be a government led re-think about how an engineering and operations / maintenance career is seen in the educational system. Over the years there has been a move away from wanting to learn what have become known as the "hard" subjects (Mathematics, Physics, and Engineering) to those known as the "soft" subjects. This situation needs to be addressed if we are to have the people (potential employees) available - and needed - to move into this exciting and challenging business and assist in developing a renewable and sustainable form of energy that will help to satisfy the world's – and everyone living on it – energy requirements of the future.

9.6.1 Industry Engagement

Education and training providers are keen to enhance engagement with employers and work closely with them in developing suitable, sector specific courses and qualifications. A more collaborative approach is regarded as essential to ensuring that supply meets demand, not only in terms of quantity of graduates, but in the quality and utility of their skills and abilities.

In line with employers - all of the providers involved in this research felt that there are gaps in provision, and on an individual level are talking steps to fill these gaps, however of most value would be a more 'joined up' approach, so that the most effective use is made of locations and resources.

The **National Skills Academy for Power** has been welcomed by the sector, as it aims to put an end to the somewhat fragmented training in the utilities sector – including renewables.

[40] http://www.4ni.co.uk/northern_ireland_news.asp?id=109124

9.6.2 Providers as drivers

Interestingly, a number of education and training providers were keen to point out that their role has not been simply to meet and supply industry demand, but rather through cutting edge research and development, and through anticipating industry trends, they have actually and will continue to facilitate and make possible sectoral growth and innovation.

9.6.3 Responsiveness

In a constantly developing and innovating sector, providers recognise that they need to be responsive to changes and movements. For example, technologies are constantly being updated and providers must ensure that where they are offering technology specific training, this is always appropriate to the most up to date technology. Similarly, in what is still a relatively young industry, there are regular legislative developments which need to be monitored and incorporated into curricula.

9.6.4 'Hands-on' training

A considerable proportion of training currently on offer is theoretically based as opposed to developing and honing practical skills and knowledge. This is something that would be welcomed by course providers, course participants and employers. Vocationally based competency training is particularly relevant to those who will be going into operations and maintenance as wind farm technicians. However, there are funding and resources challenges in achieving this which have to be addressed. Nevertheless, experience is absolutely critical in the skills mix required by employers of potential recruits.

9.6.5 Diversity of training

There are various starting points from which a person may access training for this sector, whether from a position of employment and they are fulfilling employer training requirements, or as a school leaver hoping to embark on a career in the renewables sector. Similarly, there is no one position which employees will seek to recruit for. Rather, there is a need for maintenance technicians, electrical engineers, and project managers to name but a few.

As such, it is vital there is diversity in what is offered, so that the needs of the students and the demands of the employers can be met. It will not be possible to have a 'fit for purpose / one size fits all' qualification.

9.6.6 Building on strong foundations

In many cases, the skills that are needed in the large scale wind energy generation sector are not new. Rather, they are skills that are already taught in more 'traditional' courses, but which require a renewables context. It is important therefore that education and training providers do not 'reinvent the wheel': rather, they should take what is there, what is relevant and useful, and add anything necessary.

For example, in the case of a wind turbine technician, someone who operates and maintains wind farms, the skills needed are largely those which are taught on mechanical and electrical engineering courses, with the addition of working at heights with high voltages, and in windy conditions.

In Northern Ireland, we have a strong industrial heritage. On this can be built a strong renewables sector.

9.6.7 STEM Subjects

Given the rapid growth and expansion of the sector (which only looks set to continue, if not increase), it may be difficult for the supply of skilled and experienced people for the workforce to keep pace. Education providers and employers alike are now recognising the importance of taking a long-term approach to the skills issues, by addressing how to increase the uptake of STEM subjects in schools and by school leavers.

10.0 Recommendations

Renewable energy development is increasingly being identified as a priority by the Northern Ireland Assembly, and recognised as creating real opportunities for economic development.

Skills issues are not confined to the renewables sector, but are facing the wider energy industry amongst others. However, as the economy becomes increasingly dependent on renewable technologies, these issues come to the fore.

Large scale wind energy generation is a hugely dynamic sector, but in order for the opportunities it presents to be realised, there are challenges to be overcome; principally, upskilling the existing workforce and ensuring there will be a suitable pool of people from which employers can recruit to ensure that their business can operate at its fullest potential, enabling Northern Ireland to become a world leader in:

- Meeting and exceeding renewable energy targets
- Training and education a renewables workforce
- Realising the economic potential of the renewables sector.

The UK must continue to be an attractive investment option for the international companies currently operating here, who have a key role in skills development and to new companies seeking to invest.

This analysis assesses existing provision in comparison with what employers earlier in the research stipulated as key priorities, identifying gaps in provision and how these might be addressed. Recommendations are made both for existing courses, and on the need for new fit for purpose qualifications.

10.1 Commonalities and Divergence

10.1.1 Do existing courses meet the requirements of employers?

There was a lack of knowledge of available courses, suggesting that the industry may value a centrally coordinated and regularly maintained database of training options for employers.

As identified through discussion with employers, there is a lack of consensus over the ideal qualifications demanded for entry into the sector. In part, this derives from the fact that there are various entry routes, from sideways movement via related industries such as petrochemicals, to further and higher education routes accessed by young people with little or no experience. As such, there will continue to be a need for a variety of education and training options the complexities, breadth and scale of the sector and the range of jobs means that there will never be a **'one-size-fits-all' qualification**, and nor should there be. Rather, there should be different options available which each fit a particular purpose, from more generic, broad engineering degrees to very specific courses designed for wind technicians.

Perhaps one efficient route would be to define a small suite of entry-level courses where there was a sufficient interest to make each economically viable. This would allow some flexibility for the those interested to select the most appropriate course for their level and discipline.

It is important to maintain a diversity of educational options to match the diversity of employment opportunities within the sector. Nevertheless, in identifying commonalities and divergence between what is required by employers and what is on offer, it is possible to draw conclusions about gaps in provision and how, through joined up working and collaborative efforts, training providers can more efficiently and more effectively meet the needs both of employers and of students.

In order to elucidate the degree to which existing courses meet employer requirements, and conversely any gaps which may need to be filled, this section of the report will take each employer priority and identify whether this priority is being met (and thus, where existing qualifications are fit for purpose) and also where it is not (i.e. where a new fit for purpose qualification could be developed). Recommendations will be suggested for bridging any identified gaps. Where courses exist, it may be more valuable to improve their offering to bring them up to the stage where they are 'fit for purpose', than to introduce an entirely new course.

10.1.2 What is 'fit for purpose'?

As noted earlier in the research, given the range of jobs within the sector, it is difficult to identify one 'purpose' against which courses should be measured as 'fit' or 'inadequate'. Fit for purpose can mean two different things depending whether it is viewed from the perspective of the employer or the trainee. We have defined 'fit for purpose' courses as those which appeal to students and to employers, as providing each with a useful outcome. For the student, this will be employment in the sector. For the employer, this will be an employee who does not require significantly more training for the job for which they have been recruited, but can come into that position ready and able to 'hit the ground running'.

10.2 Matching supply and demand

10.2.1 Employer demand: Securing a healthy supply pool for hard-to-fill vacancies

Employers identified certain positions as being harder to fill than others, and of key importance to the future of the industry. The concern is that this will force employers to recruit from abroad, and set salaries artificially high, or recruit people who are insufficiently qualified and skilled, and train them post-employment. This could constrain the development of the sector, given the time it would take to bring these employees to a stage where they are fit-for-purpose, or financially in terms of remuneration and / or training costs.

In particular employers in Northern Ireland are concerned that there are not currently a sufficient number of people qualified as electrical or power engineers, and even more worryingly, that the number of students taking these courses continues to decrease. Given the ongoing expansion of the sector, it is projected that more service and maintenance technicians will be required.

There is a real shortage of skilled offshore workers particularly: mariner skills, masters, chief officers, crane drivers, navigators, electrical engineers and riggers. With the growth of the offshore wind sector, it is likely that this will become more of an issue unless these appropriate measures are taken to secure a supply of skilled people.

Queens University Belfast (QUB) currently offers an undergraduate degree programme in electrical and electronic engineering, which also gives students the opportunity to specialise in power engineering in their final year. The university consults regularly with industry to ensure that the course specification matches their needs, and several organisations with which QUB has strong links – NI Electricity, ESB, Airtricity and General Electric amongst others – accommodate students on work placements. To this end, the qualification is fit-for-purpose in that it produces students qualified as

electrical engineers with experience in power engineering and who are able to go into industry with the skills required by employers. However, where this qualification falls short is in its appeal to students: the number of students applying for this course has decreased by more than half in recent years and continues to fall. It is self-evident that a course which can provide students with the skills and qualifications they need to work in industry, but does not have sufficient numbers of students taking the course, falls short due to another reason and is therefore not fit-for-purpose.

Recommendations:

- There needs to be an increased awareness amongst school leavers not only of courses available but of what these courses mean in terms of career paths and employment opportunities. Students who are keen to work in large scale wind energy generation may not be aware that a degree in electrical and / or power engineering is a key route in to the sector.
- Employers and education providers alike are keen to increase uptake of STEM subjects in schools and awareness of careers in the renewables industry. This is essential if a long-term and sustainable solution is to be sought in addressing the potential skills bottle neck identified as a concern by employers.
- The sector's image and attractiveness can be improved through engagement with careers teachers in schools and careers services at colleges and universities.
- Employers and education providers alike should examine how they can make best use of transferable skills and support sideways movement; for example the shortage of electrical and power engineers could – in the short term at least – be addressed by attracted employees from the declining petrochemicals industry while a shortage of turbine technicians could support an intake of car mechanics into the industry (skilled in mechanics and hydraulics).

10.2.2 Employer demand: 'Soft Skills'

One area where employers identified potential weaknesses in job applicants and existing employees is in 'softer' skill areas such as communication, negotiation and project management. In order to maximise their employee potential, and for reasons of cost efficiency some employers would welcome more – as they see it - 'well rounded' education and training. Further, as planning conditions become more onerous, with much greater interfacing and interaction in the various stages of a large scale wind energy project (from site development through to power generation), staff are required with not just the sufficient technical skills, but also what are traditionally considered the 'softer' skills. If we consider the 'hard' skills to be specific engineering or technical training, and 'soft' skills to be personal effectiveness gained in effective communication, and time management ,and professional effectiveness in people and project management, in the broader renewables context, then the solution may be 'smart' courses which combine 'hard' and 'soft' skills training. The difficulty is that these skills are most often experience based, and developed through placements and / or apprenticeships.

This is not currently training which is included in courses and qualifications available in Northern Ireland.

Recommendations:

- Course providers should consider either providing specific modules covering topics such as effective communication and project management, or integrating learning into existing provision.

10.2.3 Employer demand: Experience alongside qualifications

Universally amongst employers, experience was emphasised as a key priority that they will expect for a new recruit to be considered 'fit-for-purpose'. As such, a 'fit-for-purpose' qualification should entail some degree of hands-on experience, and ideally for this to be integrated into all aspects of the course. Additionally, employers were keen for new recruits to have some form of previous industry experience, whether as a result of their sideways movement from a related industry, or derived from work placements or internships accessed by more recent course graduates.

Some employers are concerned that a lack of experience amongst potential new recruits leaves them unprepared for entry into the workforce. They speculate however that the decline of traditional oil and gas industries may release a suitable pool of labour that have the relevant skills sets to move directly into occupations within the renewables sector.

A number of qualifications available within the province offer useful experience to their students. Both the University of Ulster and Queens University Belfast have laboratory and workshop facilities where students can get 'hands-on' with some of the technologies they are learning about, and additionally each requires students to partake in directly relevant work placements. The universities have access to leading industry figures in the Northern Ireland renewables sector through advisory panels and securing industry-buy in and input to their provision. However it must be emphasised that with regards to work placements and similarly internships or graduate programmes (all of which they identified as highly desirable) employers have a great deal of responsibility as well. Course providers can only provide these options with the direct support of industry, with individual employers agreeing to take on students for a defined period of time either prior to them achieving their qualifications or shortly after.

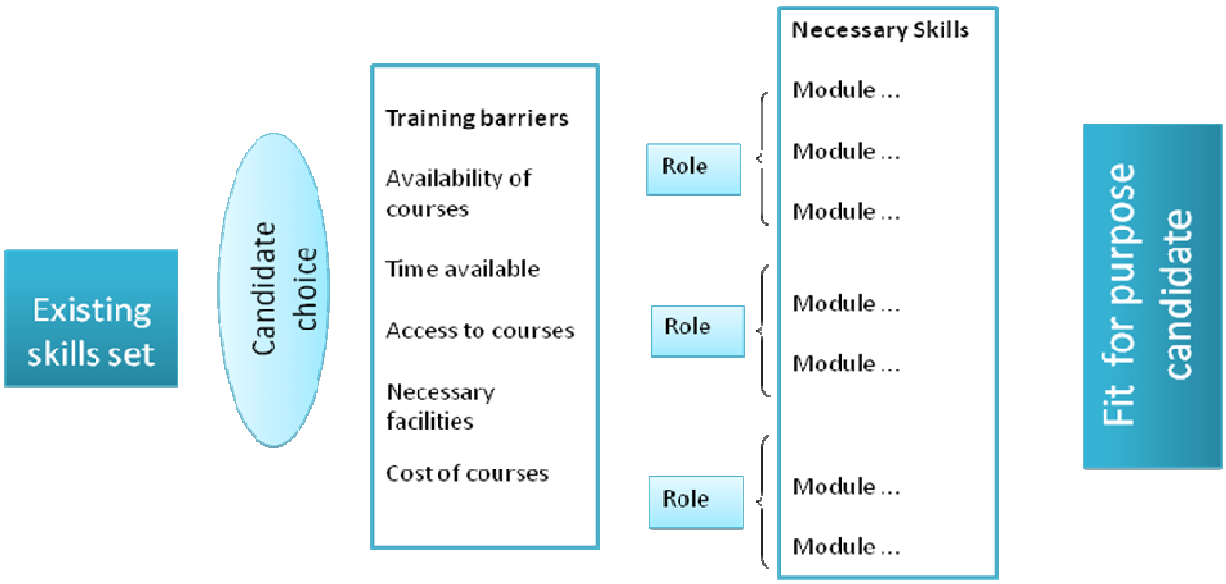
Interesting developments have taken place in Letterkenny with regards to hands on experience, industry buy in and work placements. Letterkenny Institute of Technology (LyIT) are finalising their programme which will include a full size training turbine with blades and a nacelle. This will prove an invaluable resource, as currently when employers in the large scale wind energy sector take on a new employee who has only recently qualified, it is possible that they will not have scaled a wind turbine, and as such may require on-the-job training in working at height. This recruit will not be fit-for-purpose until they have received this training. The output from the LyIT course therefore will be a qualified wind turbine technician with, most importantly, the hands-on experience of working at height, with a large scale wind turbine and to the appropriate health and safety regulations – a fit-for-purpose employee.

Recommendations:

- Employers and education providers need to come together to provide the most fit-for-purpose qualifications. Employers should play an active role in taking on students and recent course graduates.
- Not all education providers will have the facilities, space or funding to be able to offer what LyIT is proposing. As such, we would recommend that course providers engage and interact with each other to see where each could benefit from a closer working relationship. For example, some training and education providers in Northern Ireland may be keen to provide their students with access to the training tower in Letterkenny, in return for access to components of their courses, or to industry contacts.
- There are benefits for sharing facilities and teaching resources. Indeed, there may be possibilities for a degree of course 'franchising' across the province.
- Student access to courses should be increased. If a course is offered through an FE college in one part of the province, this may not be an option for someone living in another part of the province.

10.3 Fit for purpose Qualifications

The diagram below outlines the training path an individual must travel in order to take them from their existing skills set to being a fit for purpose job candidate.



An individual starts with their existing skills set and having made a choice as to the role or job they would like to pursue within the sector, they need to overcome any barriers to training before embarking on the course that contains the modules required for the role they desire. A 'fit-for-purpose' qualification is one which contains modules providing the student with all of the necessary skills that will make them a fit for purpose candidate.

The 'fit-for-purpose' qualification will likely contain the following elements:

- High quality technical and skills based training with a recognised qualification
- Separate or integrated training in 'softer' skills incorporated (e.g. communication and project / time management)
- Experience based modules with 'hands-on' training
- Industry experience through work placements or internships
- Health and safety training through working at height

- Joined up thinking and working amongst the various education and training providers, and also with employers and industry representatives.

Not all courses can provide each of these options, and it is important that there is access within Northern Ireland to a range of qualifications, both specific and more generic, as different employers will have different requirements, as will students from different backgrounds (whether school leavers or seasoned professionals). With the introduction of the EU Skills National Occupational Standards for Power, and through this research identifying employer priorities and assessing them against available provision we have been able to make some recommendations which any new fit for purpose qualification should incorporate.

10.4 Concluding Points

Certain key positions – electrical and power engineers and project managers - prove particularly difficult to fill, principally due to applicants lacking in skills or experience deemed essential by employers. A priority therefore is to work towards there being a sufficient pool from which to recruit for these positions and thereby avoiding the anticipated skills "bottleneck".

In order to realise training and recruitment aspirations, employers have identified a need for collaboration between industry and education to achieve courses tailored to meet industry needs. This collaboration should extend not just to further and higher education, but also into schools through the promotion and encouraged uptake of STEM subjects, ensuring that there is a sufficient supply chain of young people moving into the industry.

Industry-wide standards, against which job applicants and existing employees can be assessed, are valuable to guide the provision of training and set out the standards by which a qualification can be measured as 'fit-for-purpose'. These standards are met by the National Occupational Standards which were published in March 2010.[41]

[41] See Annex 2

10.5 Skills Priorities in the Short, Medium and Long term[42]

Short Term	Medium Term	Long Term
• Consolidation of systems and skills • Retention and motivation of existing skills • Improved structure • Quicker recruitment to address rising market demands • Team building • Sustainable growth • Controlled expansion with good quality staff • Meeting development timetable	• Training and investment • Expansion into new areas (implication is increased recruitment) • Uniformed processes • Develop new skills • Maintain variety of work for staff to allow internal movement • Organisational development • Job satisfaction • Skills to improve growing sales	• Expansion overseas and into new sectors • Development plans for all staff • Succession planning • Controlled expansion with good quality staff

[42] Renewable Sector Skills Analysis Scotland

11.0 Annex 1: Bibliography

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12.0 Annex 2: National Occupational Standards for Power

The National Occupational Standards for Power combine

- Technical skills – from electrical and functional testing of fitting plants through to removing and replacing gearboxes and drives.
- Soft skills – from leading the work of teams and individuals to organising the use of resources.
- Experience – demonstration and completion of skill based units.

Further information can be accessed on the EU Skills website:

http://www.euskills.co.uk/home/resources/search/folder/147/title/Electricity+Power+Utilities+NOS

Based on the National Occupational Standards for Power, EU Skills, in collaboration with City and Guilds and the corporate members of RenewableUK, have developed two qualifications based around the National Occupational Standards for Power, the details of which are outlined below. It is likely that these qualifications will fill identified gaps, provided there is sufficient collaboration with existing education providers and with employers.

City & Guilds Level 2 Diploma in Electrical Power Engineering - Wind Turbine Operations and Maintenance NVQ (QCF)

City & Guilds Level 3 Diploma in Electrical Power Engineering - Wind Turbine Operations and Maintenance (QCF)

Details for each qualification can be accessed on the following websites:

http://www.accreditedqualifications.org.uk/qualification/50095651.seo.aspx

http://www.accreditedqualifications.org.uk/qualification/50095663.seo.aspx

The Level 2 Diploma requires students to take three mandatory modules, in 'working with other people', how to 'develop yourself in the work role' and 'complying with statutory regulations and organisational safety requirements', with an additional six modules selected from a choice of nine:

- Inspect and maintain Pitch Systems
- Inspect and maintain Yaw Systems
- Inspect and maintain Control systems
- Inspect and maintain low voltage systems

- Inspect and maintain convertor systems
- Inspect and maintain Hydraulic systems
- Inspect and maintain Lubrication & Drive Train systems
- Inspect and maintain turbine structures
- Inspect and maintain high voltage systems

The Level 3 Diploma contains five compulsory modules, two skills based units:

- Fault Location and Diagnosing Faults on Wind Turbine Systems
- Remove and Replace Wind Turbine Systems

And three broader units:

- Work with other people
- Protect the environment during wind turbine maintenance activities
- Complying with statutory regulations and organisational safety requirements

Finally, there are twelve skills based modules from which a student can pick nine:

- Inspect and maintain Pitch systems
- Inspect and maintain Yaw systems
- Inspect and maintain Control systems
- Inspect and maintain low voltage systems
- Inspect and maintain Convertor systems
- Inspect and maintain Hydraulic systems
- Inspect and maintain Lubrication & Drive Train systems
- Inspect and maintain high voltage systems
- Configure Pitch Systems
- Configure Yaw Systems
- Configure Control Systems
- Configure Converter Systems

Skills required for the renewable sector are typically not brand new skills; rather the broader skills already exist but require a renewables 'context'. The core skills of workers in the energy-related sectors are highly transferable, being based on a thorough grounding in technical competence. As such, there are two key skills priorities:

- Up-skilling and re-skilling the existing workforce, and workers in related industries (petrochemicals, mechanics and engineering);
- Longer term strategies to increase the uptake of STEM subjects in schools, and subsequently related courses and qualifications at Further and Higher Education levels.